VOLUME XV March, 1926 NUMBER 3

APR 13 1926 Medical Lib.

[FOUNDED IN 1906 AS THE AMERICAN QUARTERLY OF ROENTGENOLOGY]

THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY

OFFICIAL ORGAN
THE AMERICAN ROENTGEN RAY SOCIETY
THE AMERICAN RADIUM SOCIETY

Editor: ARTHUR C. CHRISTIE, M.D.

EDITORIAL BOARD

JAMES T. CASE, M.D. H. K. PANCOAST, M.D. WILLIAM DUANE, PH.D.

ADVISORY BOARD FOR PATHOLOGY

JAMES EWING, M.D. Cornell University
EUGENE L. OPIE, M.D. University of Pennsylvania
ALDRED S. WARTHIN, M.D. University of Michigan

PUBLISHED MONTHLY FOR THE AMERICAN ROENTGEN RAY SOCIETY
BY PAUL B. HOEBER, INC., 67-69 EAST 59TH STREET, NEW YORK CITY

AMERICAN ROENTGEN RAY SOCIETY MEETINGS

Twenty-Seventh Annual Meeting

BOOK-CADILLAC HOTEL, DETROIT, MICH.

MAY 17, 18, 19, 20 AND 21, 1926

AMERICAN RADIUM SOCIETY

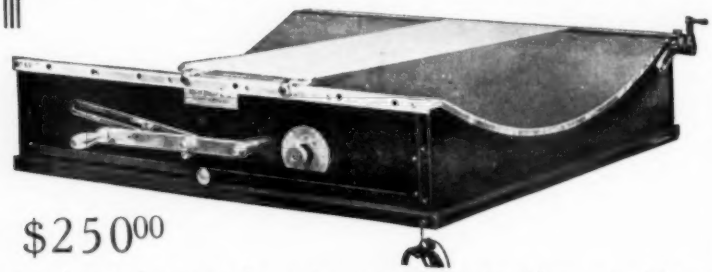
Eleventh Annual Meeting

BAKER HOTEL, DALLAS, TEXAS, APRIL 19TH AND 20TH, 1926

Entered as second-class matter, March 3, 1916, at the Post Office, New York, N. Y., under the Act of March 3, 1879.

YEARLY SUBSCRIPTION, $10.00 SINGLE NUMBERS, $1.50

BRADY'S POTTER-BUCKY DIAPHRAGM



$250.00

NEW FEATURES

A new and improved type of grid construction that secures even more brilliant results than our previous grid.

A neat compression band attachment for holding the patient still during exposure.

Patient brought nearer to plate.

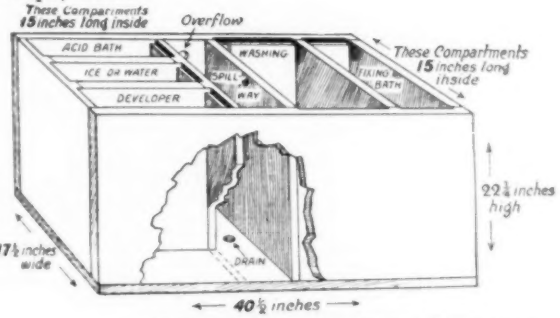
An electrical contact device for operating a signal lamp or which can be connected to most time switches for making the exposure automatically, from 1 to 90 seconds time at $5.00 extra charge.

Our speed control is accurate and reliable and timed in actual seconds. It does not require constant repairs. We claim it is the smallest, neatest and most effective Bucky on the market, 6:1 ratio grid cutting off practically 90% of secondary. Takes all makes of cassettes to 17 x 17 size, operates in horizontal or vertical position, and does Stereoscopic work in either direction.

All-metal construction electrically welded and practically indestructible. They do not get "out of date." Price $250.00 list with cash discount for quick payment.

DEVELOPING TANKS

Our stone tanks are considered the best designs and values on the market. Each has a space for ice or hot water for controlling the developing temperature. The 5 and 6 compartment styles also have a 4" air space to prevent temperature of wash water from affecting the temperature of developer. Lengths over all 24½"-34"-40¼" respectively. Illustration shows our regular 6 compartment style. Special styles to order. We have many sizes of enamel tanks also. Send for special circular.



	4-compartment	5-compartment	6-compartment
Prices shipped from Virginia	$45.00	$53.50	$60.00
Prices shipped from Chicago, Boston or Brooklyn	$50.00	$58.50	$65.00

DR. GRANGER'S SINUS MASK

For radiography of the sphenoid, etc., at 17° angle. We furnish these to fit all standard makes of cassettes. Specify outside size of your cassette when ordering. Made for 8 x 10 only. Price $8.50.

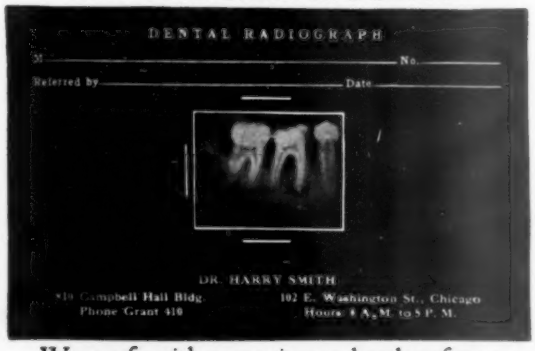
INTENSIFYING SCREENS

Get our net prices on screens either alone, or mounted in cassettes. It may save you some money. We are distributors on Buck X-Ograph cassettes, and carry the standard makes of screens.

BARIUM SULPHATE (Paragon)

We have furnished enormous quantities of this to the profession during the last 10 years. We are prepared to furnish this in prepared form with malted milk or dry milk incorporated at $30.00 per 100 lbs. packed in 25 lb. sealed tin cans. 5 lb. & 10 lb. sizes also available. Price of regular barium $24.00, fluffy style $26.00 per hundred.

DENTAL FILM MOUNTS



We can furnish many sizes and styles of mounts in cardboard or the all-celluloid types. Special designs if desired. Very liberal discounts are allowed on orders for 100 or more. Get our new price list #160—with discounts.

Special on gross lots of #1 size film $6.96.

ASK FOR OUR LATEST PRICE LIST AND DISCOUNTS

GEO. W. BRADY & CO., 761 S. WESTERN AVE., CHICAGO

THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY

VOL. XV MARCH, 1926 No. 3

PHYSICAL AND BIOLOGICAL PROBLEMS IN HELIOTHERAPY

I. STANDARDIZATION OF ULTRAVIOLET LAMPS FOR CLINICAL USE

BY ERNST A. POHLE, M.D.

Assistant Professor of Roentgenology, University of Michigan Medical School

ANN ARBOR, MICHIGAN

INTRODUCTION

IN this series of articles we will discuss certain problems which have come up in our department while using ultraviolet lamps for the treatment of various acute and chronic conditions, and present the results of our investigations. The time has come when heliotherapy should be standardized so that it can be carried out on a less empirical and more scientific basis.*

One of the primary considerations when administering any medicament to a human being must be the question of dosage. There is no doubt that much has to be done in this respect in the field of heliotherapy. We will, therefore, go into that subject first.

The type of lamp most commonly used is the mercury vapor lamp emitting the well known discontinuous spectrum of mercury between 14,000 and 2,000 Å. We have employed this model connected with 110 volts A.C. in our experiments. Its ultraviolet part that interests us in therapy covers a range of from 4000 to 2000 Å., while the shortest wave length in the sun spectrum reaches only a little below 3000 Å. The distribution of intensity in the ultraviolet part of the mercury spectrum is given in Figure 1. When the human skin is exposed to this radiation, a marked erythema appears in a few hours, if the applied dose is sufficient. In order to decide what wave length is of the greatest biological effect, Hausser and Vahle[1] have undertaken a careful and thorough study of the erythema time for various wave lengths by using a quartz spectrograph with a very high diffraction power. They come to the conclusion that the "Erythemmaximum" (maximum of erythema) is found at 2970 Å. The results are illustrated in Figure 2, which shows that the curve passes through a maximum at the above mentioned wave length.

One might deduct from these findings that a dosimeter for ultraviolet radiation should have its optimal sensitiveness around 3000 Å. This, however, applies only to new mercury quartz burners, because these burners are undergoing a process of aging: they deteriorate (Coblentz[2,3]) but not evenly, the shorter ultraviolet waves being decreased in intensity first and most. A measuring device of the mentioned property will not always give, for this reason, a true reading of the total intensity (Keller[4]) (Schall and Alius[5]). These authors referred to have worked with the filter method, by inserting glass of various composition and transparency, but Dorno[6] has drawn attention to the fact that considerable error may creep into the results by using this procedure. Nor will a non-selective dosimeter,

* A very important step in this direction was taken recently when the "Council on Physical Therapy" was organized. *J. Am. M. Ass.*, 1925, lxxxv, 1310.

as a thermopile, answer all requirements, because there is one wave length of optimal biological effectiveness. All investigators agree, however, that the ideal

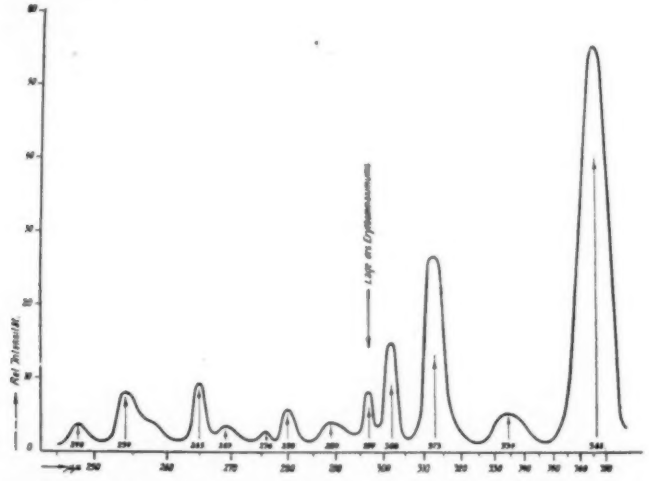


FIG. 1. The distribution of the intensity in the ultra-violet part of the mercury spectrum of the quartz lamp. The ordinate shows the intensity in arbitrary units; the abscissa gives the wave lengths in $\mu\mu$($1\mu\mu$ = 10 Å.) (After Hausser and Vahle.)

contrivance would be a measuring apparatus, the sensitiveness of which would run parallel to that of the skin. According to our present knowledge, we must state

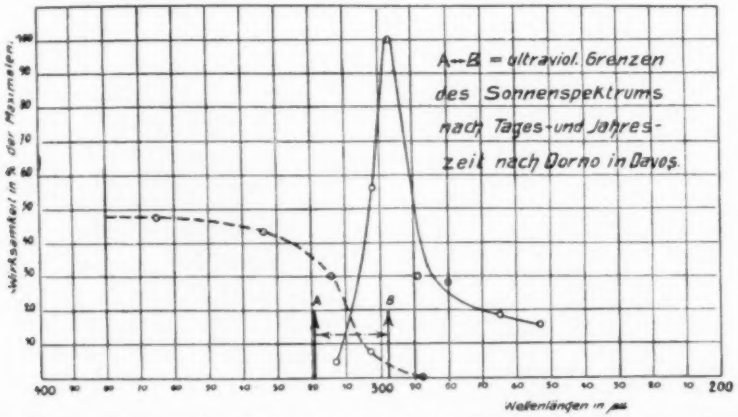


FIG. 2. The light erythema as a function of the wave length (straight lined curve). The dotted curve represents the permeability of the human skin (0.1 millimeter thickness) for various wave lengths according to Hasselbalch. Between the arrows **A** and **B** is the ultraviolet radiation of the sun as measured during the year in Davos (Dorno). The ordinate gives the erythema effect in percentages of the maximum; the abscissa represents the wave length in $\mu\mu$ (After Hausser and Vahle).

that there is no such device possible and none of the existing dosimeters is physically or chemically exact.

The reasons for calibrating ultraviolet lamps are obvious. Not only is it of scientific interest but we owe it to our patients. It is also desirable, if not imperative, that the doses we give be reproducible; on studying the enormous literature on heliotherapy, one finds it impossible to compare the results on account of the lack of a well-defined dose. Last, not least, it is essential to control the output of these lamps regularly because they deteriorate, as mentioned before, to a certain variable extent, and we administer an entirely different dose with a burner after 500 hours of use as compared with a new one.

The first practical method* as far as we know has been published by Bering and Meyer,[7] in 1912, who used the photochemical oxidation of hydriodic acid dissolved in distilled water. Under the influence of light radiation, the oxygen of the air forms water with the hydrogen of the hydriodic acid, at the same time freeing iodin, according to the equation,

$$2IH + O = I_2 + H_2O$$

Following the suggestion of Pinnow,[8] an acid solution of potassium iodid was chosen because hydriodic acid will be formed if any mineral acid is added to a solution of potassium iodid in water. The iodin freed under the influence of light rays can be measured quantitatively by titration with thiosulphate. A series of tests resulted in adopting as a standard procedure the mixing of 25 c.c. of 5.3 per cent sulphuric acid and 25 c.c. of 1 per cent potassium iodid solution and its exposure to ultraviolet radiation in a glass cylinder with a quartz window. To such irradiated mixture 3 to 5 drops of a 1 per cent starch solution are added as indicator. A blue color will form immediately as in the well known iodin-starch test.

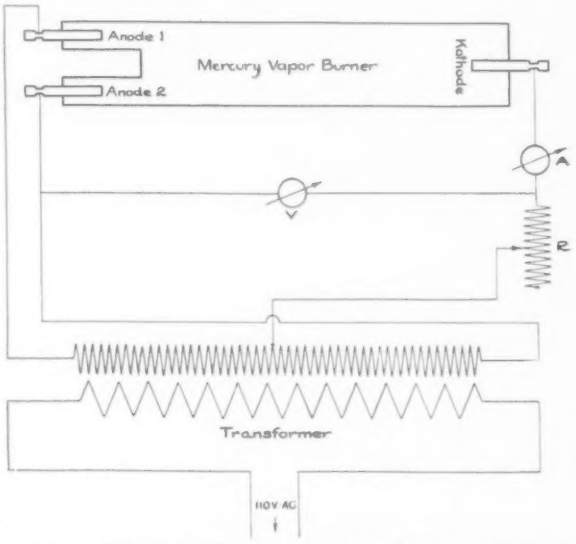


FIG. 3. Schematic diagram of the electrical circuit of a mercury quartz burner connected to 110 volts A. C.; voltmeter, amperemeter and rheostat placed as during the measurements.

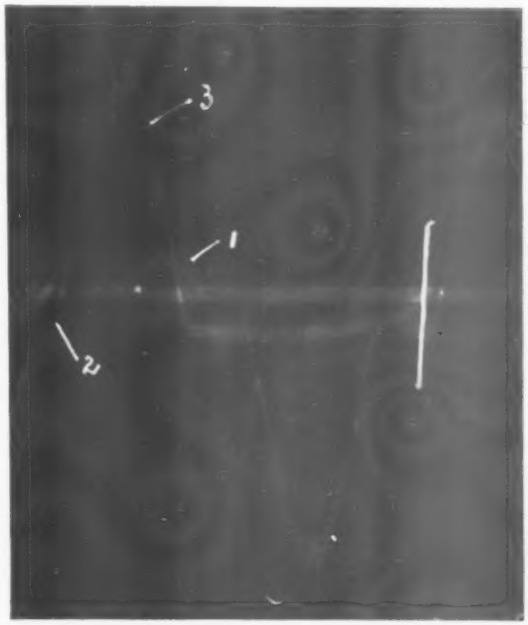


FIG. 4*a*. (1) Oscillogram of the primary voltage; (2) potential between anode 1 and anode 2, and (3) between either anode and the cathode.

FIG. 4*b*. (1) This represents the primary current; (2) the current to anode 1 or anode 2, and (3) to the cathode.

The amount of free iodin is titrated now with a N/400 sodium thiosulphate solution. Bering and Meyer[7] called a normal dose that amount of ultraviolet radiation

* The photometer (A. Larson), the apparatus of Bunsen and Roscoe, the electrochemical photometer (Becquerel), and the scale photometer (Vogel) were too complicated to be used in practice. (Quoted from Bering and Meyer.[7])

which frees an amount of iodin equivalent to 10 c.c. of an N/400 sodium thiosulphate solution when titrated. The unit was named one Finsen.

This method was modified by Hackradt[9] who used a colorimeter for comparing the intensity of the discoloration in order to avoid titrating. Keller[4] went a step further in simplifying the test. He added to the mixture of potassium iodid and sulphuric acid, a few drops of starch solution and 1 c.c. of N/400 sodium thiosulphate solution before exposing the mixture to ultraviolet radiation. The coloration of the whole solution into blue marked the end of the reaction. He chose as unit that amount of ultraviolet radiation producing the just explained reaction, calling it *one ultraviolet unit* (1 U.V.U.). When applied to the skin, double the distance as used in the test between burner and surface of the solution must be taken. He found that this unit represented the medium erythema dose for normal human skin and claimed that the photochemical reaction runs parallel to the visible erythema of the skin. His work was criticized by Schall and Alius[5] who noted that a number of precautions have to be taken to reduce the error in the test. They also state that it does not run parallel to the erythema but is most sensitive towards ultraviolet radiation of short wave length. Another photochemical reaction for measuring ultraviolet radiation has been published recently by Anderson and Robinson;[10] their method requires, however, titration.

Inasmuch as we were looking for a test which is easily carried out by every physician, we decided to study Keller's[4] modification of the iodin starch reaction with special consideration of the criticism made.

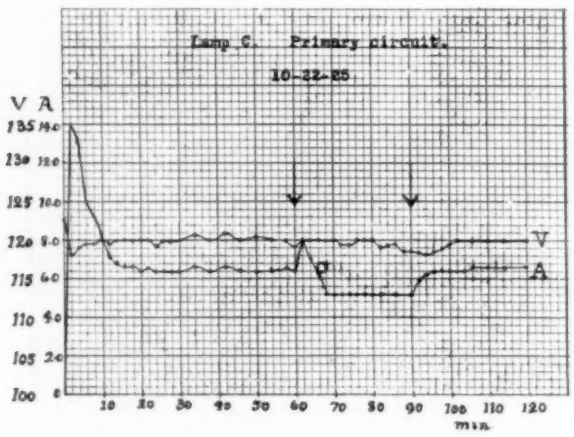


FIG. 5a. Potential and current in the primary circuit observed over two hours. The first arrow indicates the moment when the hood was closed, the second arrow marks the opening of the hood.

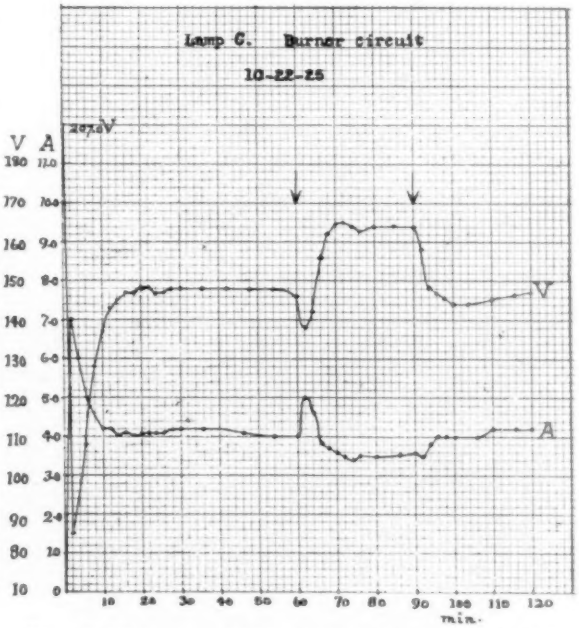


FIG. 5b. The same observations as in Figure 5a in the burner circuit.

EXPERIMENTS

When carrying out the first experiments, we followed the suggestion of the manufacturers of our lamps; all lights were burning for from five to ten minutes before the first test was undertaken. Our experience was very much like that of Schall and Alius.[5] We found variations of from 15 to 26 per cent in the readings on one light under the same conditions on different days. A thorough investigation of the electrical conditions revealed some interesting facts which can be explained only by certain properties inherent for an electrical device of such construction. The mercury burner is based on the principle of the well-known mercury rectifier having two anodes which are connected with

the ends of the secondary windings of the transformer, while the cathode is on its center (see Fig. 3). Therefore, we have the full potential between anode 1 and anode 2, about one-half the potential between anode 1 and cathode or anode 2 and cathode. This is illustrated by the oscillogram* given in Figure 4*a* which shows the primary line voltage and the voltage between the two anodes and one anode and the cathode. In Figure 4*b*, the oscillogram for the current corresponding to the potential as shown in Figure 4*a* is demonstrated. From these curves we conclude that it is practical to arrange voltmeters and amperemeters with a rheostat for balancing slight variations in the current corresponding to the diagram in Figure 3. The voltmeter reads thus,—the potential drop over the amperemeter, which is negligible in this case. We recorded in that way the changes of potential and current every minute from the time of lighting the burner until the point of constancy. In Figure 5*a* (primary line) and Figure 5*b* (burner circuit), it is evident that it takes about twenty-five to thirty minutes until the electrical equilibrium has been reached.† After the lamp had burned one hour, we closed the hood which is provided for so-called local treatments. The effect upon the electrical conditions is expressed by a short drop followed by a considerable rise of the potential and by a drop of the current. It also takes from twenty to thirty minutes after the hood has been re-opened to regain normal conditions. This fluctuation is, in all probability, due to temperature differences in the air surrounding the burner (Schall and Alius[5]). We therefore left the hood always open in order to keep the lamp burning constantly.

Most of the transformers coming with the ultraviolet lamps have an "intensifying knob," a device that will raise the watt input and is supposed to increase the intensity of the total spectrum about 30 per cent. Our measurements without and with the intensifier are recorded in Figure 6*a* (primary line) and Figure 6*b* (burner circuit); they show that there is a rise of the potential of about 25 to 30 per cent while the current is only slightly increased after a temporary rise. The temperature in the burner is, of course, much higher when using the intensifier which, in itself, is a very undesirable feature. As Coblentz[3] has shown, the deterioration will take place much more rapidly at higher temperature in the burner. The emitted radiation shows an increase in intensity of 20 to 30 per cent according to our tests. We do not believe that this reduces enough the time of treatment to warrant the so much faster depreciation of the burner.

The test itself has to be carried out with certain precautions. A considerable amount of 5.3 per cent sulphuric acid should be

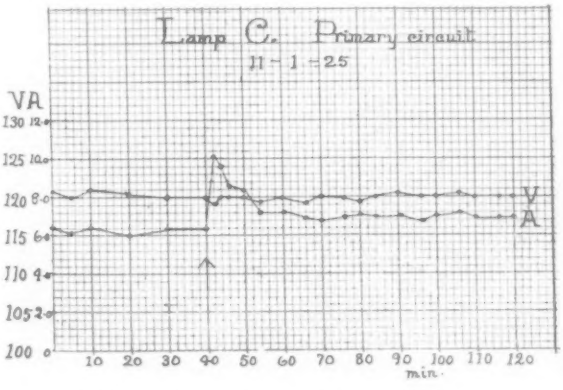


FIG. 6*a*. Primary potential and current; the arrow marks the switching in of the intensifying device.

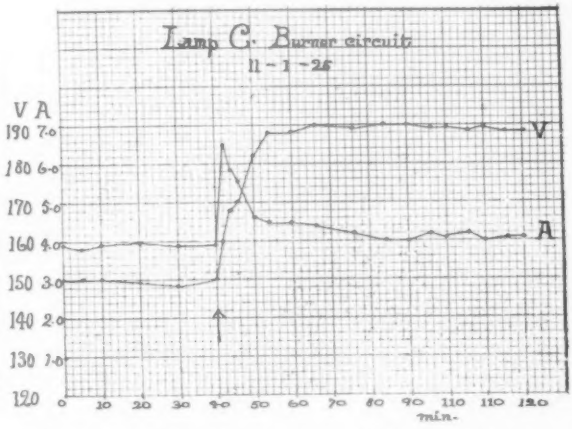


FIG. 6*b*. The same observation as in Figure 6*a* in the burner circuit.

* The author is indebted to Professor J. H. Cannon, of the Department of Electrical Engineering, University of Michigan, for taking these oscillograms on one of our lamps.

† The two curves are only an example out of a series of similar and practically identical curves gained from several lamps on different days. In the meantime, Hoernicke (*Strahlentherapie*, 1925, xx, 664) has confirmed these findings.

prepared so that it will last for a large number of tests. The acid does not change appreciably, and at the same time a solution of constant composition is guaranteed.

The potassium iodid solution must be freshly prepared for each test. We found it very convenient to keep the salt in powder form in brown bottles, protected from daylight, in quantities of 250 milligrams each. Before using it, we dissolved that amount in 25 c.c. of distilled water.

The starch solution has to be fresh. In the beginning of our experiments we were confronted by difficulites which could be traced to a deterioration of the starch solution.* The best way to prepare it is to dissolve one gram of chemically pure starch in 5 c.c. of cold water, then stir this paste into 95 c.c. of boiling water.

The only solution presenting some difficulty is the N/400 sodium thiosulphate solution. It is advisable to make it up in

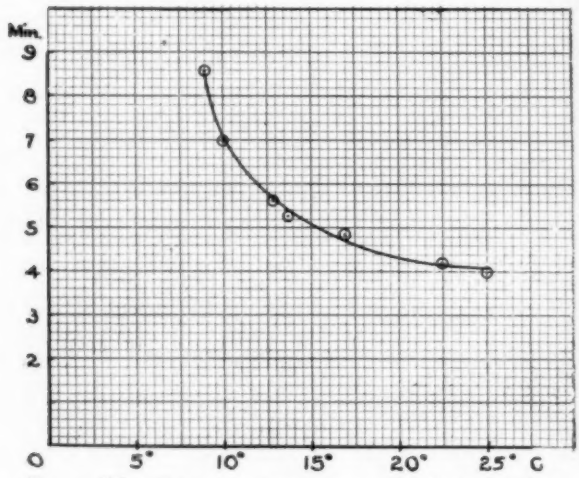


FIG. 7. The effect of temperature on the photochemical test.

N/10 strength by dissolving 24.83 gm. of the salt in crystal form in 100 c.c. of distilled water. For scientific purposes the N/400 solution can be made of this stock solution and be controlled by titration. In parallel tests, we found, however, that for practical purposes it is permissible to mix 1 c.c. of the N/10 solution with 39 c.c. of distilled water.

As Keller[4] has already pointed out in his first paper, there are definite relations between surface and volume of the test solution; very slight variations in the diameter of the glass vessel in which the mixture is irradiated produced considerable difference in the readings. We have chosen, therefore, a 100 c.c. pyrex glass of 5 cm. inner diameter. These containers are easily available on the American market and if a series of the same size is always kept, this error is ruled out.

FIG. 8. The test box.

Like all other chemical reactions, the iodin starch test is influenced by temperature. The factor for 10°C. is 2.0 – 3.5 (Schade[11]). In exact measurements it is necessary to make a correction or to keep the test solution at a constant temperature. We have used for this purpose a very simple cooling device by placing the test glass in a beaker glass filled with water through which a copper spiral was running, carrying a cold water stream. The influence of the temperature between 10° and 25°C. is shown in Figure 7. For variations

*I wish to express my thanks to Professor H. G. Smeaton, from the Department of Chemistry, University of Michigan, who has given us many helpful suggestions.

between 20° and 25°C. the error is negligible for practical work. A correction can be made, however, by plotting the temperature curve as done in Figure 7, measuring the temperature in the test solution before and after irradiation, calculating the mean value and correcting the result accordingly. Controls were done by exposing the test solution to daylight; no discoloration could be noticed after twenty-four hours. In order to be able to carry out the test conveniently, we had a box (Fig. 8) built with a window glass in the front wall and an opening on one side. The rear wall is papered white, and white cardboard may be placed under the test glass to facilitate the observation of the color change. We proceed then as follows:

(1) Lamp burns with opened hood for thirty minutes and is adjusted over the center of the box at 25 cm. distance from burner to surface of the test solution. It is desirable to have a voltmeter and an amperemeter in the burner circuit for the control of the watt input. One must remember, however, that for alternating current the product of volts and amperes is not equal to the number of watts; a special wattmeter has to be used if the exact watt input shall be measured. We have done this and found by varying the watt input that there is a simple relation between it and the intensity of the spectrum (Coblentz, Schall and Alius).

(2) Twenty-five c.c. of 1 per cent KI plus 25 c.c. of 5.3 per cent H_2SO_4 plus 5 drops of 1 per cent starch solution plus 1 c.c. N/400 $Na_2S_2O_3$ solution in a vessel of 100 c.c. content and 5 cm. inner diameter is placed under the center of the burner at 25 cm. distance.

(3) After one or two minutes blue clouds begin to form in the solution, which should then be stirred with a glass rod. After a certain time the whole solution will turn blue and the time required is measured by a stop watch. It takes only a little practice to learn to recognize the end of the reaction.

Keller[4] has worked out the test in just this form and defines the ultraviolet unit (1 U.V.U.) as that amount of ultraviolet radiation producing the above photochemical reaction. When applied to the skin double the distance as used in the test must be taken.

When testing our several lamps with burners of different ages, we found, of course, as was to be expected, considerable variation in the time required to produce one ultraviolet unit. Taking the test at various distances, it appeared that the inverse square law does not hold true for this type of light (Coblentz,[2] Keller[4]).

This may be explained by several facts: the inverse square law is based on a point

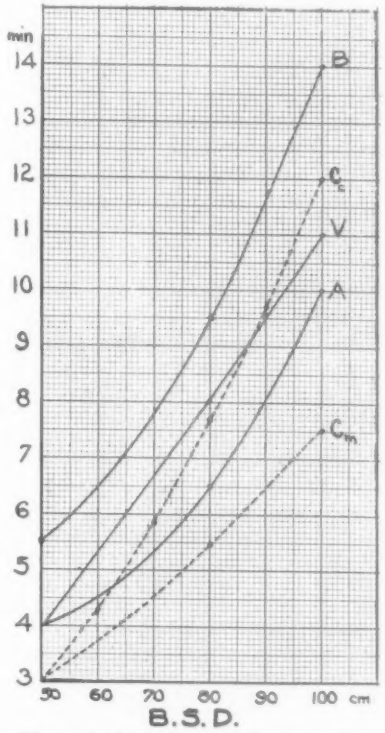


FIG. 9. The relation between burner skin distance and ultraviolet unit. Curve C_c is calculated with the inverse square law, curve C_m is found by actual measurements. T = 22°C.

source of light, while the quartz mercury burner has a considerable surface. There is also a certain quantity of reflected radiation coming from the hood of the lamp and this depends somewhat upon the form of the hood and the position of the burner. We had two forms of hoods, one of parabolic shape and the other of cylindric shape. We found that the exponent for the lamp with a parabolic hood is closer to 1 than that for the lamp with the cylindric hood. The results of some of

these measurements at 22°C. are represented in Figure 9. For four lamps called A, B, C, V, lamp V (cylindric hood) follows much more closely the inverse square law, or, in other words, the exponent comes close to 2. The discrepancy in the calculated (curve C_c) and the measured (curve C_m) output of one lamp is considerable.

In all our tests, we have applied the measured unit to several normal individuals. We can state that 100 per cent of the dose defined by this photochemical test will, in almost every case, produce a mild erythema appearing after two to five hours, lasting from twenty-four to seventy-two hours and showing a slight tanning which disappears usually in ten days to two weeks. Twenty-five per cent of the unit will cause a just visible reddening in about half the cases, 150 per cent produces a deep red erythema, while 200 per cent of the unit when given as a first exposure usually causes a burning sensation. The degree of erythema depends, of course, also upon the part of the body which is irradiated. It is well known that the ordinarily covered parts of the upper body are more sensitive than the extremities and the head. We have usually chosen the upper anterior thigh or the upper flexor side of one arm for the exposure.

DISCUSSION

We realize, of course, that this test is not physically nor chemically exact, but it is our impression based on the experience of several months while treating 20 to 30 patients daily with ultraviolet radiation that this method when carefully employed will certainly bring us a definite step forward toward the scientific application of heliotherapy.

The next problem presenting itself points in two directions; one will be to develop a practical method for defining the degree of erythema and pigmentation after exposure; in other words, the designing of a tintometer. It seems that the Munsell system of color analysis offers the underlying principle, and encouraged by a recent publication from the Mayo Clinic[11] we have started this work. At the same time an attempt will be made to define the optimal wave length for the photochemical test described in this paper. It will be remembered that previous investigators state that the test is more sensitive towards ultraviolet radiation of short wave length. If the burner shows signs of aging, which means a loss of intensity in the shorter waves, the method will not give a true reading of the total intensity. It might be necessary, therefore, to use a certain factor of correction when testing ultraviolet lights after a certain time of use. We will employ a photoelectric cell as control device following the suggestion of Dorno;[6] this investigation is also under way in cooperation with the Department of Physics, University of Michigan.

SUMMARY

(1) The photochemical test (Bering-Meyer) in its modification by Keller for the measuring of ultraviolet radiation is described; certain precautions to be observed in order to obtain reliable results for clinical work are explained.

(2) It is suggested to use as a basis for ultraviolet treatments, the dose called *one ultraviolet unit* (1 U.V.U.) This unit is defined by a photochemical reaction and represents the medium erythema dose for normal human skin.

(3) The monthly testing of ultraviolet lamps is recommended.

(4) Further investigations of the discussed problems will be published in a second paper.

REFERENCES

1. Hausser, K. W. and Vahle, W. Die Abhängigkeit des Lichterythems und der Pigmentbildung von der Schwingungszahl (Wellenlänge) der erregenden Strahlung). *Strablentberapie*, 1922, xiii, 41–71.
2. Coblentz, W. W., Long, M. B., and Kahler, H. The decrease in ultra-violet and total radiation with usage of quartz mercury vapor lamps. *Scientific Papers of the Bureau of Standards*, 1918, xv, 1.
3. Coblentz, W. W. Some physical characteristics of the radiation from quartz mercury lamps. *Am. J. Electrotherap. & Radiol.*, 1921, xxxix, 395.
4. Keller, P. Über die Wirkung des ultravioletten Lichtes auf die Haut unter besonderer Berücksichtigung der Dosierung. *Strablentberapie*, 1923, xvi, 52–74. Also in "Handbuch der Strahlentherapie," Vol. 1, p. 217. Berlin, 1925.
5. Schall, L., and Alius, H. J. Zur Biologie des Ultraviolettlichts. I. Mitteilung. *Strablentberapie*, 1925, xix, 559.

6. Dorno, C. Zur Technik der Strahlungsmessungen, *Strahlentherapie*, 1924, xviii, 177.
7. Bering, F., and Meyer, H. Methoden zur Messung der Wirksamheit violetter und ultravioletter Strahlenquellen. *Strahlentherapie*, 1912, i, 189–207.
8. Pinnow. *Chem. Centralbl.*, 1901, ii, 965. (Quoted from Bering and Meyer.)
9. Hackradt, A. Kolorimetrische Dosierung ultravioletter Strahlen künstlicher Lichtquellen mittels des Autenreith-Königsbergerschen Kolorimeters, I. *Strahlentherapie*, 1920, x, 1137–1144.
10. Anderson, W. T., and Robinson, F. W. The oxalic acid-uranyl sulfate ultraviolet radiometer. *J. Am. Chem. Soc.*, 1925, xlvii, 718.
11. Schade, H. Die physikalische Chemie in der inneren Medizin, Dresden, 1920, p. 31.
12. Rowntree, L. G., and Brown, G. E. A tintometer for the analysis of the color of the skin. *Am. J. M. Sc.*, 1925, clxx, 341–347.

THE TREATMENT OF INTRAORAL CARCINOMA BY CONTACT APPLICATION OF RADIUM*

BY G. W. GRIER, M.D.

Roentgenologist to Presbyterian Hospital, Passavant Hospital, Magee Hospital, St. John's Hospital; Associate Professor of Roentgenology, University of Pittsburgh

PITTSBURGH, PENNSYLVANIA

EPITHELIOMA inside the mouth differs from that of the face in the following particulars: (1) It grows rapidly and involves underlying structures early; (2) it metastasizes early; (3) it is more resistant to radiation, and (4) it is kept constantly moist by infected fluids, and light and air are excluded. These conditions promote infection and hinder the repair of the ulcer left after destruction of the lesion by irradiation. For the reasons just mentioned the treatment of carcinoma in the mouth is much more difficult and the prognosis much less favorable than is the case with similar lesions located on the skin surface. Added to these is the fact that the lesion is in a location where it is difficult to approximate the radium accurately to the lesion and painful to keep it there. When all these drawbacks are considered it is small wonder that one finds little to boast of in the results obtained. The one consolation left to the radiologist is that no other form of treatment offers any better results. Surgery is seldom seriously considered in extensive intraoral malignancy. The actual cautery is better but leaves much to be desired. Electrocoagulation in the hands of a few has given very good results, but usually must be supplemented by radium. Under such unfavorable circumstances, the choice of radium treatment might be looked upon as making the most of a bad bargain.

In outlining a plan of treatment for any case of cancer of the mouth, two facts should be kept constantly in mind. The first is that metastasis to the lymph nodes is the most serious complication which can occur; and the second is that traumatism to the primary lesion may promote metastasis. In order to combat cervical metastasis the neck should either be thoroughly irradiated before treatment of the primary lesion; or, if the individual preference is for a block dissection of the neck, that may be done. My own preference is for roentgen irradiation, using the deep therapy technique, but I have no objection to offer against block dissection unless the glands are already quite large. If they are, it has seemed to me that operation is always followed by prompt recurrence and more rapid growth than before. If deep therapy roentgen-ray apparatus is not available, a radium pack applied to the neck is preferable to low voltage roentgen-ray treatment. Whatever technique is used complete irradiation of the neck should be carried out before the primary lesion is treated. By so doing, one not only saves time in applying what is probably the most important part of

*Read at the Tenth Annual Meeting, American Radium Society, Atlantic City, N. J., May, 25–26 1925.

the treatment, but it is also possible that such treatment blocks the lymphatics to a certain extent and lessens the likelihood of spreading the disease by any traumatism which may be incident to the treatment of the primary lesion. As mentioned above, I prefer deep roentgen therapy for this purpose, giving a mild erythema dose at one sitting. This treatment is repeated in about six weeks. The factors used are 200 kv., 4.5 ma., 20-inch distance, 0.5 mm. copper and 1 mm. aluminum filters, applied for 85 minutes over an area 4 inches square. The same treatment is used whether there are palpable nodes or not. There have been a number of cases in which distinctly palpable glands have disappeared following this treatment. The method has been in use only about two years, so it is too soon yet to know whether these results are permanent.

The response of malignant cervical glands to irradiation is not always the same. As a general proposition, if the glands are the size of a pigeon's egg or larger, it is unlikely that they will disappear by this treatment. However, this is not always the case. We have treated two cases of cancer of the tonsil in which the cervical glands were larger than a hen's egg and in both the glands have entirely disappeared for a period of two and a half years. The primary lesion in each was treated by radium and has likewise remained well for a similar period of time. There seems to be no way to determine whether the glands in a given case are susceptible to radiation except by trial. It has been our practice to allow two or three days to elapse between the treatment of the cervical region and of the lesion in the mouth. The treatment of the primary lesion may have to be altered, depending on its size and location, but as a general proposition I am a firm advocate of the use of well-filtered radium radiation applied in contact whenever possible. It is generally supposed that the beta rays of radium are responsible for the beneficial effects produced in the treatment of superficial lesions. However, if aluminum instead of brass filters are used in contact applications to these lesions with the idea of increasing the percentage of beta radiation, the same results will not be obtained. This may be due to one or both of the following reasons: (1) The lesion extends more deeply into the tissue than we imagine; (2) owing to the more violent surface reaction when aluminum filters are used, the radium is left on a much shorter time, and this is insufficient to destroy the malignant cells which are at the depth of the lesion.

Our earliest cases of cancer of the mouth were treated without any filters except rubber tissue and the patient held the radium in contact with the lesion. This technique was devoid of results. If the patient was strong minded enough to actually hold the radium against the lesion for an hour or so in spite of the pain, the result was a surface burn which had little effect in hindering the progress of the disease. If brass or lead filters are used so that practically everything is filtered out except the gamma rays, the results are very much better. It is true that a much longer application is necessary, but it is quite probable that it is this increased length of treatment which produces the beneficial effect. Our usual method of application is to divide the radium into brass capsules, each capable of holding 25 milligrams, and these, after being covered by a piece of rubber tubing, are placed side by side, using a sufficient number to cover the entire lesion. These are then fastened to one end of a flat strip of sheet lead and placed against the lesion. The lead is bent in such a manner as to approximate the radium accurately to the lesion. The end of the lead strip which protrudes from the mouth is bent against the side of the face or chin in such a position as to hold the inner end firmly against the lesion. It is then fastened with adhesive tape and bandages. The lead in the neighborhood of the radium can often be shaped in such a manner as to protect normal structures from irradiation. The radium is left in position for fifteen hours. As a result of this treatment, a superficial reaction follows which involves all tissues in contact with or in the immediate neighborhood of the radium. This is quite painful while it lasts, but the lesion always heals up without complications in from

four to six weeks. One dose is usually sufficient to destroy the lesion. If it does not, the probabilities are that it cannot be cured by radium. However, one cannot always be sure that a partial healing is not due to uneven dosage from slipping of the radium. For that reason the dose may be repeated at the end of six or eight weeks if a part of the lesion remains unhealed. If there has been no decrease in the size of the lesion after the radium reaction heals, further radium treatment is probably useless.

The technique described can be carried out satisfactorily on lesions located in the floor of the mouth, the roof of the mouth, alveolar process, either upper or lower, or buccal mucous membrane. In the latter instance if the lesion is very large, the preparation of the radium as described may make an applicator which is too bulky to be placed between the teeth and the inside of the cheek. Under such circumstances, the radium containers may be placed unfiltered in a row on a strip of lead and another thin strip of lead placed over them to act as a filter. The whole can be bound together by adhesive plaster and in this way an applicator made which is sufficiently thin to go into the desired space. Sometimes considerable experimentation is necessary to devise an applicator which holds the radium in contact. Occasionally, where the lesion extends for a considerable distance on a curved surface, it may be better to make two separate applications, one after the other, treating part of the lesion at each applicaton. Lesions of the tongue and of the tonsillar region cannot be satisfactorily treated by contact application, as a rule, because of the difficulty of applying and holding the radium in place for a sufficient period of time.

The two chief advantages of this method of treatment are the absence of sloughing and less danger of exciting metastasis. As mentioned before, a radium reaction follows the treatment, but this is superficial, is not nearly so painful as a slough, and heals readily. It comes on about ten days after treatment and is active for about ten days more. I have never seen any serious consequences from the radium reaction by this method. On the other hand, the introduction of radium needles or emanation seeds is always accompanied by a certain risk of sloughing, either from the necrosis which occurs immediately around the needle or seed, or from infection incident to their insertion. This risk may not be very great if the procedure is carried out by experienced hands and there are occasions when it must be met, since the treatment cannot be carried out in any other way, as for instance, in lesions of the tongue, tonsils, or other inaccessible regions. The energetic marketing of emanation seeds is placing radium in the hands of many physicians whose only knowledge of radium treatment is gained by reading the instructions which accompany the article.

The question as to whether certain treatment stimulates metastasis is very difficult of proof. One can never be certain but that the metastasis would have occurred in the absence of such treatment. However, when a case of cancer of the mouth shows no signs of enlarged cervical nodes before the introduction of radium needles or emanation seeds and a few days after there are glands in the neck as large as a walnut, it would seem that the burden of proof might reasonably be shifted to the other side. It has been argued that the glandular enlargement which occurs under these circumstances is inflammatory and not malignant. One of our cases died from such a metastasis following the introduction of radium needles into an inoperable cancer at the base of the tongue. The lesion on the tongue remained healed in this case. In another case of sarcoma on the dorsum of the tongue, and so far back as to be inoperable, the primary lesion has disappeared and remained well following treatment with needles. A few days after introduction of the needles a large lump appeared in the submaxillary region and has so far resisted all treatment. This case looks hopeless at this writing. It is true that the cases mentioned were hopeless anyway, and that no other method of treatment was at all feasible. The point which this paper is intended to emphasize is that if contact applications are feasible they offer just as good a prognosis without the unpleasant complications mentioned.

RADIUM EMANATION IN THE TREATMENT OF CANCER OF THE TONGUE AND OTHER PARTS OF THE ORAL CAVITY*

BY FRANK EDWARD SIMPSON, M.D., AND ROY EMMERT FLESHER, M.D.

CHICAGO, ILLINOIS

IN the treatment of intraoral cancer two important phases of the disease must be considered—the primary lesion and the lymph nodes of the neck. In the treatment of the primary lesion we rely solely on two methods of using radium emanation: (1) the implantation of bare glass tubes of a strength of from 0.5 to 1 mc., and (2) the application of not less than from 500 to 1000 mc. to the surface of the lesion.

Prior to the year 1919, we treated 20 cases of cancer of the tongue by the methods then in vogue, i.e. surface irradiation to the tumor and the intratumoral implantation of metal needles containing radium sulphate. In several cases encouraging temporary results were obtained. On the whole, however, complete disappointment with both of these methods was experienced. In the latter part of 1919, we began burying radium emanation in bare glass tubes in the tongue lesion. The results obtained by this method have far surpassed those obtained by the implantation of filtered emanation.

It has been objected by some that the use of unfiltered emanation is not true radium therapy because the caustic action of radium is invoked.

All theoretical objections, however, must give way before successful results. One of the main objections to the use of filtered emanation for implantation is that it is difficult to determine the exact dose necessary to destroy every cancer cell. Apparent cures, however, may sometimes be obtained with filtered emanation, but in our experience the effects are more often palliative than curative. When the implantation of bare tubes is contemplated, a preliminary irradiation to the surface of the lesion with from 800 to 1000 mc. is, we believe, advisable. This procedure theoretically lessens the danger of transplanting viable cancer cells.

In using bare emanation tubes several factors may be considered. (1) Local anesthesia is usually satisfactory; (2) an adequate supply of bare tubes should be available. It not infrequently happens that the number of tubes estimated to be necessary and prepared prior to implantation is insufficient. From 5 to 40 tubes may be required in average cases, each tube containing from 0.5 to 1.0 mc.; (3) the type of lesion. Very large lesions are not suited to the implantation method. In certain cases so large an area of necrosis may be produced by the action of the tubes that sepsis may be pronounced and local healing is rendered difficult. Such cases may receive palliative surface irradiation. It must be emphasized that a bed of healthy tissues capable of producing good granulations should surround a growth subjected to the implantation of bare tubes; (4) accuracy in the implantation of the tubes is essential. Implantation into the border of the lesion, avoiding if possible the apparently healthy tissue, is advisable. Usually palpation determines more accurately the borders of the growth than inspection, but great care must be taken not to traumatize or massage the lesion. We usually make a rough diagram of the lesion on a piece of paper prior to implanting the tubes and mark with a number the spot where each tube is to be buried. Tubes are implanted 1 centimeter apart evenly throughout the lesion in accordance with the suggestion of H. J. Bagg. It is not advisable to rely upon gamma ray effects and leave certain parts of the lesion, such as the center, uninfiltrated with tubes.

In our experience, the uniform implantation of the tubes, so that a beta ray effect is obtained in every part of the lesion, is necessary for success.

In cancer of the buccal mucous membrane, palate, mucous membrane of the

* Read at the Tenth Annual Meeting, AMERICAN RADIUM SOCIETY, Atlantic City, N. J., May 25–26, 1925.

jaws, etc., we sometimes rely solely on massive doses of filtered emanation applied to the surface of the lesion. It is not ordinarily advisable to implant bare tubes close to bony structures. In 4 cases that we have treated, a sequestrum formed which separated many months after the implantation.

In making surface applications to intraoral cancer we usually apply, at the present time, not less than from 800 to 1000 mc. The average quantity applied in the present series of cases was 740 mc. With the apparatus at a distance of 2 mm., an exposure of approximately 300 to 450 mc-hr. may be given to an area of from 4 to 6 sq. cm. If adjacent areas of the same lesion are treated separately, care must be taken to prevent the radiations from overlapping. Lesions that are favorably situated, e.g., cancer of the buccal mucous membrane should, in addition, be irradiated from the skin surface in order to get a "cross fire" effect.

THE LYMPH NODES OF THE NECK

There are three general methods of treating the lymph nodes adjacent to intraoral cancer, viz., surgery, surgery combined with irradiation, and irradiation alone.

Surgery. In Broders'[1] series of 516 lip cancers, reported from the Mayo Clinic, the lymph nodes of the neck were operated on in 449 cases. Metastases were found in 105 cases (23.4 per cent). None of Broders' cases in which more than one group of glands was involved and no case in which the cervical or submental glands were affected was known to be alive at the time of the report. The 10 patients with metastases in whom good results were reported were cases in which the submaxillary lymph nodes on one side only were involved.

Judd and New[2] have reported the results of the surgical treatment of 118 cases of tongue cancer observed at the Mayo Clinic over a period of ten years. In 52 patients, the lymph nodes of the neck were found involved and in 66 the lymphatics were free. Of the 52 patients with glandular involvement, 7 were living at the time of the report. Only 2 patients were known to have survived the five-year period after operation. Of the 66 patients without metastases, 7 lived less than one year after operation. At the end of twelve years, 24 were living, having survived operation from one to twelve years.

Surgery Combined with Irradiation. The plan of combining surgery with the implantation of bare emanation tubes was originated by Quick[3] and his associates at the Memorial Hospital, New York City. Quick employs radium for the primary lesion and an expectant plan of treatment for the cervical nodes.

If no nodes are palpable surface irradiation is used. If there are palpable nodes surface irradiation is supplemented by a conservative neck dissection. If the nodes are operable they are removed and bare emanation tubes are imbedded in the operative field. If the growth has broken through the capsule of the gland, radical removal of the glands is not undertaken but bare emanation tubes are inserted throughout the mass.

Quick has reported 148 cases of carcinoma of the tongue treated according to the plan just described; 43 (29 per cent) were clinically well for an average period of two years. Neck dissections were done in 58 cases. Recurrence developed in 25.8 per cent. Of 162 lip cases, 80 were clinically well for an average period of eighteen months. Neck dissections were done in 22 cases. Recurrences developed in seven cases.

Irradiation Alone. Schreiner and Kress[1] have reported 136 cases of lip cancer treated solely by irradiation (radium and roentgen rays) during a period of eight years (1915–1922). In 69 cases there were no palpable nodes in the neck. In 36 cases lymphatic involvement was apparent and 31 cases were inoperable. Of the 36 cases with lymphatic involvement, 13 were clinically well for periods of from three to over five years. These authors believe that at least 34 per cent of the cases that show operable lymphatic involvement can be healed by roentgen irradiation alone. It may be mentioned, however, that unless lymph nodes are examined microscopically it is difficult to be positive of their carcinomatous nature. One may be left in doubt, therefore, as to the actual value of irradiation of the lymph nodes.

In treating the lymph nodes of the neck we have usually relied on surface irradiation. At a distance of 3 cm., 7000 mc-hr. may be given to an area of 16 sq. cm. The average quantity of emanation that we have used for surface irradiation is 1310 mc. In suitable cases, we favor the implantation into the glands of bare emanation tubes. We are inclined to believe, however, that this procedure should be reserved for cases in which the glands are easily accessible.

RESULTS

Between December 31, 1919 and December 31, 1924, we treated with radium emanation 141 cases of intraoral cancer, of which 115 cases were diagnosed both clinically and microscopically. There were 30 cases of tongue cancer and 85 cases in which other parts of the oral cavity were involved. The results of treatment are shown in the following tables.

TABLE I

RESULTS OF TREATMENT OF 55 CASES (12 TONGUE CASES AND 43 CASES IN OTHER SITES) WITHOUT PALPABLE NODES

	Number	Per Cent
Not traced	9	16.5
In poor condition	0	0
Abandoned treatment	0	0
Dead	6	10.9
Clinically well	40	72.6

TABLE II

RESULTS OF TREATMENT OF 60 CASES (18 TONGUE CASES AND 42 CASES IN OTHER SITES) WITH PALPABLE NODES

	Number	Per Cent
Not traced	10	16.6
In poor condition	1	1.6
Abandoned treatment	3	5.0
Dead	39	65.1
Clinically well	7	11.7

TABLE III

GENERAL RESULTS OF TREATMENT OF 115 CASES (30 TONGUE CASES AND 85 CASES IN OTHER SITES) WITH AND WITHOUT NODES

	Number	Per Cent
Not traced	19	16.5
In poor condition	1	0.9
Abandoned treatment	3	2.6
Dead	45	39.2
Clinically well	47	40.8

TABLE IV

DURATION OF APPARENT CURE IN 7 CASES WITH NODES

	Number
Well over 4½ years	1
Well over 3½ years	1
Well over 2½ years	1
Well over 1 year	3
Well over 11 months	1

TABLE V

DURATION OF APPARENT CURE IN 47 CASES WITH AND WITHOUT NODES

	Years	Months
Longest duration	5	
Shortest duration	..	8
Average duration	2.53	

	Number	Per Cent
Well over 4 years	10	21.2
Well over 3 years	9	19.0
Well over 2 years	12	25.6
Well over 1 year	12	25.6
Well over 6 months	4	8.5

COMMENT ON TABLES

Of the series of 115 unselected cases of cancer of the tongue and other parts of the oral cavity 47 are living, 45 are dead and there is either an unfavorable report or no recent report from 23. The statistics would be better if certain advanced cases in which little except palliation was to be expected had been excluded. Thus in 9 tongue cases the posterior third of the tongue and the lymphatic glands of the neck were affected. Cases of this type are usually hopeless. One of us (Simpson[5]) has reported one case of this type, however, in which recovery occurred. In this patient, the posterior part of the tongue was involved, and two years later large lymph nodes developed in the neck. The patient remains clinically well after nearly eight years.

CONCLUSIONS

Radium emanation is of great value in intraoral cancer. For the best results at least from 500 to 1000 or more millicuries must be available, and some experience with its effects is desirable. The use of small quantities of radium by the novice tends to discredit the method and to take away from the patient his chances of recovery.

REFERENCES

1. BRODERS, A. C. Squamous-cell epithelioma of the lip. *J. Am. M. Ass.*, 1920, lxxiv, 656.
2. JUDD, E. S., and NEW, G. B. Carcinoma of the tongue: General principles involved in operation and summary of results obtained at the Mayo Clinic. *Surg., Gynec., & Obst.*, 1923, xxxvi, 163–169.
3. QUICK, DOUGLAS. Radium Report of the Memorial Hospital, New York. Second Series, 1923. Paul B. Hoeber, New York, p. 31, et seq.
4. SCHREINER, B. F., and KRESS, L. C. Contribution to the treatment of cancer of the lip by irradiation. *J. Cancer Research*, 1924, viii, 221–233.
5. SIMPSON, FRANK E. Radium in malignant disease. *Surg. Clinics, Chicago*, 1919, iii, 63.

AN INVESTIGATION OF THE RESULTS OBTAINED IN CANCER OF THE TONGUE TREATED BY RADIUM AND ROENTGEN RAYS*

BASED ON A STUDY OF 127 CASES

BY BERNARD F. SCHREINER, M.D., F.A.C.S., AND HAROLD F. R. BROWN, M.D.

State Institute for the Study of Malignant Disease (Burton T. Simpson, M.D., Director)

BUFFALO, NEW YORK

CANCER of the tongue is one of the most distressing and fatal forms of neoplasm that we are called upon to treat. The results of any form of treatment have been very discouraging and it is for this reason that an investigation has been made of the results of the cases treated by radiation at the Institute.

There have applied for treatment at the State Institute for the Study of Malignant Disease, 127 cases of cancer of the tongue (1913–1925). Of these cases, 106 occurred in males and 21 in females, making the proportion of female to male, 1 to 5. Of all cases admitted to the Institute since the beginning, approximately 3 per cent were suffering from cancer of the tongue.

Ninety-six of the males gave a history of using tobacco in some form and one female smoked cigars and a pipe. The complaints of the patients on entrance were as follows: Sore tongue from canker sores, 62; sore tongue from irritation of sharp teeth, 31; sore throat, 15; swelling of tongue and difficulty in swallowing, 7; cracked tongue, 3; stinging and burning of tongue, 3; wart on tongue, 1; 4 patients gave a history of biting the tongue and one dated her present trouble from a sudden hemorrhage from the mouth. The age incidence is depicted in Table I. Approximately 50 per cent of the cases showed varying degrees of dental caries associated with very poor hygiene of the mouth. Forty-six cases, or 35 per cent had a positive Wassermann reaction on admission, while 16 others gave a history of venereal infection, but their Wassermann reactions were negative. Thirty-three cases, or 26 per cent, gave a history of cancer in the family. The lesion was distributed as described in Table II.

TABLE I

AGE INCIDENCE IN DECADES

	20–29	30–39	40–49	50–59	60–69	70–79	80–89	Total
Group I	..	4	8	16	14	6	1	50
Group II	1	..	17	24	24	10	1	77
Total	1	4	25	40	38	16	2	127

The youngest patient was twenty-four years old and the oldest was eighty-two years old. The majority of the cases treated occurred between the ages of fifty and seventy.

TABLE II

LOCATION OF LESION AT TIME OF EXAMINATION ON ADMITTANCE

	Group I	Group II
Base of tongue	13	24
Base of tongue and floor of mouth	6	8
Base of tongue and tonsil	1	10
Base of tongue and epiglottis	..	2
Whole side of tongue	6	9
Whole side of tongue and pillar of tonsil	..	2
Whole side of tongue and floor of mouth	1	3
Anterior half of tongue	1	3
Anterior half of tongue and floor of mouth	..	2
Anterior third of tongue	6	3
Anterior third of tongue and floor of mouth	..	1
Anterior two-thirds of tongue	1	1
Posterior two-thirds of tongue	..	4
Posterior two-thirds of tongue and tonsil	..	2
Middle third of tongue	11	2
Midline, upper surface	1	
Frenum of tongue	3	1
	50	77

The diagnosis in 110 of the cases was proven by biopsy. One case showed basal cell epithelioma, 4 malignant papilloma and the remainder either mucous membrane or pearl epithelioma. It was deemed unwise to remove tissue in the remaining 17 cases.

In Group 1, we have placed all cases in which the lesion was confined to the tongue or immediately adjacent tissues by direct extension, with no demonstrable metastases, at the time of admission.

* Read at the Tenth Annual Meeting, AMERICAN RADIUM SOCIETY, Atlantic City, N. J., May 25–26, 1925.

In Group II, have been placed all cases in which there were definite metastases in the lymph-bearing areas in addition to the lesion on the tongue.

Five cases are reported as undetermined. One patient failed to return after first treatment, 3 had a palliation for seven months and another for eight months and then were lost

EPITHELIOMA OF THE TONGUE

TABLE OF GROUP I CASES THAT ARE CLINICALLY WELL

Case No.	Admission Date	Location of Lesion	Length of Time Well to Mar. 15, 1925	Remarks
5108	Apr. 19, 1915	Frenum	.....	Patient was clinically well May 28, 1915, but has been lost track of.
*6375	Sept. 29, 1920	Base (dorsum)	4 yrs., 1 mo.	Patient was clinically well Nov. 22, 1920, and had recurrence Aug. 9, 1922, 1 yr. 9 mos. later. Was retreated and has been well since Nov. 15, 1922 for 2 yrs. 4 mos.
6528	Dec. 15, 1920	Rt. Base	11 mos.	Patient was pronounced well Jan. 26, 1921, but died Dec. 12, 1921 from paralysis.
6660	Feb. 23, 1921	Rt. Base	1 yr., 6 mos.	Patient was pronounced well Apr. 8, 1921 and died Oct. 1922 from pneumonia.
6854	May 13, 1921	Anterior third	3 yrs., 8 mos.	Patient clinically well July 18, 1921.
6870	May 18, 1921	Rt. middle third	3 yrs., 9 mos.	Patient had syphilis and very bad teeth on admission.
6904	June 6, 1921	Base of tongue	3 yrs., 8 mos.	Patient had syphilis and very bad teeth on admission.
490	Feb. 16, 1922	Midline upper surface	2 yrs., 2 mos.	Patient was well Sept. 1922, and had a recurrence Mar. 10, 1924, 1½ yrs. later. Was retreated and has been well since July 9, 1924, or for 8 mos. On admission teeth were in bad condition. There is no evidence of tumor tissue at the present time.
*7539	May 26, 1922	Middle third	2 yrs., 8 mos.	Patient clinically well July 24, 1922.
578	Nov. 15, 1922	Anterior third	1 yr., 10 mos.	Patient was also suffering from syphilis at the time of admission.
7989	May 18, 1923	Middle third	.....	Patient was clinically well June 29, 1923 and has been lost track of since July 27, 1923. Patient was also suffering from syphilis.
8161	Sept. 10, 1923	Anterior third	1 yr., 4 mos.	Patient clinically well Nov. 26, 1923.
8182	Sept. 28, 1923	Rt. base	1 yr.	The lesion on tongue was clinically well, but in March, 1924 he was treated for a node in the neck and has failed to return. Patient also had syphilis.
8347	Feb. 18, 1924	Middle third	1 yr.	Patient clinically well Mar. 15, 1924.
864	Sept. 8, 1924	Middle third	3½ mos.	Patient clinically well Nov. 28, 1924.
916	Dec. 15, 1924	Middle third dorsum and frenum	1 mo.	Patient clinically well Feb. 9, 1925. He also has syphilis.

*Case 6375 was a basal cell epithelioma and Cases 7539 and 578 were malignant papillomas. The others were either mucous membrane or pearl epithelomas.

RESULTS IN GROUP I

16 Clinically well
5 Undetermined
4 Not treated
1 Unimproved
4 Palliation (current cases)
20 Died

50 Total No. in Group I

There were 50 cases in Group I; 4 were not treated and the percentage is based on the remaining 46 cases; 16 of these cases, or 34 per cent have been clinically well for periods varying from 1 month to 4 yrs., 1 mo.

track of, all efforts to locate through the follow-up system being futile.

The 4 cases reported not treated appeared for examination but failed to return for treatment.

The one case reported as unimproved is probably dead, but has been lost track of. He did not respond at all to treatment.

Four current cases are reported as having palliation, 2 for three months, the third for seventeen months and the fourth was clinically well for two yrs., five months,

TABLE III

TABLE OF CLINICALLY WELL CASES ACCORDING TO YEAR

	Group I		Group II	
	No. Treated	No. Clin. Well	No. Treated	No. Clin. Well
1913	..	..	1	
1914	..	..	1	
1915	3	1	1	
1916	..	..	2	
1917	1	..	2	
1918				
1919	2	..	4	
1920	6	2	2	
1921	12	4	7	
1922	8	3	20	
1923	8	3	14	
1924	7	3	20	1
Total	47	16	74	1

but had a recurrence in the tongue in December, 1923, and has had palliation since that time. Twenty cases died, 2 of which were unimproved. The average length of life for the remaining 18 cases was ten and a half months; the longest palliation being two yrs., ten months and the shortest three months.

RESULTS IN GROUP II

1 Clinically well
6 Palliation (current cases)
2 Not treated
7 Undetermined
5 Unimproved
56 Died

77 Total No. in Group II

The patient reported as clinically well was admitted Nov. 17, 1924 with an ulcerating lesion on the right base of the tongue and palpable nodes in the neck. The lesion on the tongue was implanted with 396 mc-hr. of radium emanation and the right and left submaxillary regions treated with high voltage roentgen rays divided over four sittings. The lesion on the tongue was pronounced clinically well Jan. 30, 1925, the nodes also having disappeared.

The 6 cases reported as having palliation from four months to one and a half years are current cases and have shown improvement.

The 2 cases reported as not treated were examined but failed to return.

Seven cases are reported as undetermined. Four failed to return after first treatment and were lost track of. The remaining 3 had palliations for two, four and ten months and then failed to return, all efforts to locate them being futile.

Five cases are reported as unimproved; 2 have been lost track of and have probably died and the remaining 3 are still living but failed to respond to irradiation, being too far advanced on admission.

Fifty-six cases are reported as dead. The average length of life for these cases was six and a half months; the longest palliation being one and a half years and the shortest one month.

TREATMENT

Prior to June, 1920, cancer of the tongue at the Institute was treated with an inadequate amount of radium which was applied by means of surface applications in 9 cases, proving a failure, with one exception. In June, 1920, we treated the first case with radium needles leaving the two needles in place for four hours. The patient received six treatments at intervals of from four to eight weeks, amounts varying from 75 mg-hr. to 700 mg-hr. The lesion on the base of the tongue was clinically well for three months and then recurred with metastases in the neck, causing death, the patient having a palliation for one year all told.

In November, 1920, we began treating the primary lesion with implantation of radium emanation seeds, using 0.8 to 1.0 millicurie seeds. This was found to be extremely caustic, escharotic and produced severe pain. For the last two or three years, we have applied seeds of from 0.3 to 0.5 millicuries to the primary lesion, and, when suitable, the metastatic nodules were also implanted with emanations. This was supplemented with high voltage roentgen rays or radium applied through one or both sides of the neck to approximate a dose of 125 to 130 per cent, (3 to 5 cm. from seeds) including the amount of the seeds. Local incision for the purpose of removing metastatic nodes and implantation has not produced very gratifying results in our hands. More recently, the lymph-bearing areas have been treated with high voltage roentgen rays, a dose of 130 per cent being administered in the course of three to four sittings during a period of ten to twelve days, which promises more than any form of irradiation which we have applied to metastatic lesions from the tongue.

DISCUSSION

In Group I, 16 of the 20 cases reported as dead, developed metastases in the neck from one to six months after the primary lesion in the tongue was treated. In 6 of the cases the lesion on the tongue was pronounced clinically well for periods varying from two to ten months, and then recurrence occurred, the patients succumbing from metastases, ulceration, infection, cachexia or hemorrhage. In Group II, the lesion on the tongue was pronounced clinically well in 11 cases for periods varying from two months to one year, the lesions recurring in 6 of the cases, while in the remaining 5, the primary lesion on the tongue remained well at the time of death which was caused by metastases in the neck. Out of these 11 cases, the metastases in the neck failed to respond to irradiation in 3 cases, temporary reduction in the size and consistency of the metastases was noted in 3 cases and disappearance of the metastatic nodes in 5 cases for from one month to one year, and then recurrence causing death. Autopsies were performed on 5 cases, 3 of which showed epithelioma of the tongue and neck and chronic interstitial nephritis. The fourth showed epithelioma of the tongue and neck, and bronchopneumonia, the fifth showed epithelioma of the tongue and peribronchial lymph nodes with metastases in the lungs and tumor masses invading the blood vessels in the lungs.

CONCLUSIONS

1. Primary cancer of the tongue has been healed in 16 out of 46 cases in Group I, or approximately 34 per cent for periods varying in time up to four years and one month.

2. In Group II we have obtained only a palliation. In 11 out of the 77 cases, the primary lesion healed; 6 recurred on the tongue in from two months to one year after, and the remaining 5 remained healed at the time of death, which was caused by metastases in the neck.

CURIE THERAPY OF EPIDERMOID CARCINOMA OF THE INTRAORAL GROUP AS CARRIED OUT AT THE RADIUM INSTITUTE, PARIS*

BY MAURICE LENZ, M.D.

Associate Radiotherapist, Mount Sinai and Montefiore Hospitals

NEW YORK CITY

EPIDERMOID carcinomata of the intraoral group are usually markedly resistant to irradiation. Though the exuberant papillary growths respond more readily to irradiation than the infiltrating ulcerative variety, both types usually require a radiation intensity, which on the skin would be followed by the shedding of the epidermis down to the papillary layer—the so-called epidermicidal dose. This dose may be administered by large radiation intensities over short periods of time or small radiation intensities over longer periods of time. In the latter case, the normal surrounding tissues are affected less than in the first method and the total dose given can, therefore, exceed that administered within a shorter period. When small radiation intensities are used for a prolonged period, advantage is taken of the fact that cells are especially radiosensitive during or near mitosis; and as the mother cells in different parts of the same neoplasm divide at various periods of time, prolonged irradiation may be assumed to strike more cells during their period of greatest radiosensitivity than the same dose given in a shorter period.

*Read at the Tenth Annual Meeting, AMERICAN RADIUM SOCIETY, Atlantic City, N. J., May 25–26, 1925.

However, the period of time within which the radiation is administered must not exceed a certain limit. Repeated irradiations with non-sterilizing intensities given over a period of months or years make the neoplasm resistant to irradiation. The cumulative effect of radiation upon the normal tissue, on the other hand, causes retrograde changes, obliterating endarteritis, and makes these tissues susceptible to infection and radionecrosis. This is especially true where beta radiation has been used repeatedly. If a permanent arrest of growth is not obtained with the first treatment, a cure by radiotherapy can rarely be expected, as subsequent irradiations become progressively less efficient.

The radiosensitivity of intraoral cancers is diminished by infection. When localized to the surface of the neoplasm, infection is comparatively unimportant as it is shed with the radiation slough of the superficial tissues. However, when it penetrates into the loose submucous tissues of the mouth, especially in the infralingual region, a chronic cellulitis or phlegmon may result. The absorption from this localized focus of infection drains the vitality of the patient and may cause cachexia. If irradiated, the protecting barrier of inflammatory tissue surrounding this infected area is broken down and the infecting organism may enter the circulation and cause death by bacteriemia. This occurs with beta, as well as with gamma radiation. Before irradiation of intraoral carcinoma is undertaken, attention should be given to the teeth and to thorough disinfection of the mouth. Ordinary cleansing usually suffices to clear up the majority of infections. For spirochetes, bismuth paste locally and salvarsan intravenously have been found of value at the Radium Institute.

When the infection of the mouth has been cleared up, the question of actual irradiation may be considered. It should be remembered that homogeneous and efficient irradiation of the entire growth and its metastases is absolutely essential in order to effect a cure. However, clinical appreciation of the true extent of the carcinoma is difficult, especially if it has reached the loose submucous tissues of the mouth, for instance, the soft palate. Exact localization is rendered more uncertain if trismus supervenes, as frequently occurs where the posterior part of the cheek is invaded. The extensive lymphatic drainage of the mouth aided by the muscular movements of the tongue, makes the occurrence of early metastases to the neck glands by embolism very common, especially in involvement of the floor of the mouth. Of 150 cases of carcinoma of the tongue collected at the Radium Institute, 94 per cent had palpable neck glands. Granting that a number of these were inflammatory, an attempt to treat them as such would have resulted in overlooking many carcinomatous glands. Yet, unless a radiation intensity sufficient to permanently arrest the entire primary lesion and its metastases is employed, there follows a more rapid increase in growth of the non-sterilized portion. Over-irradiation, on the other hand, is followed by retrogressive changes of the normal surrounding structures. Such tissues readily become infected and undergo early or late radionecrosis. Where the radium, especially if unfiltered, is placed near bone, and only a thin layer of mucous membrane intervenes between the radiating focus and the periosteum, as for instance in involvement of the inferior maxilla, osteonecrosis may result. This is frequently started by trauma, e.g., the extraction of a tooth. Infection, suppuration and sequestration of the bone follow. Healing is slow, or does not take place at all until the sequestrum is removed surgically. In irradiated tongue cancers hemorrhage from the infralingual artery may further complicate the case, especially if bare tubes have been used, and the zone of radionecrosis, normally surrounding each bare tube, happens to be near the vessel. On the other hand, if the initial quantity of emanation in the bare tubes be diminished, on account of fear of extensive radionecrosis, as one would be tempted to do near the junction of the neoplasm and the normal tissues, non-sterilization of the part outside of the radionecrotic area results. When filtered interstitial irradiation is used the initial quantity of emanation may be raised without such fear. Bare tubes are not used at the Radium Institute.

In very small intraoral tumors surgery is preferred, as a radical removal of the entire lesion and thorough histological examination are thus made possible. In carcinomata of the tongue which successively evolve from patches of leucoplakia, extirpation of the tongue is preferred to irradiation. As new carcinomata appear in the leucoplakial patches, practically the entire tongue would have to be destroyed by irradiation if this method were used. Interstitial irradiation is avoided in cases which invade the mucous membrane covering the inferior maxilla, without involving the tongue. In these cases either the maxilla is resected and this is followed by external curie therapy, or resection is not done, but the lesion is treated by radium placed on molds inside of the mouth. In cheek, floor of mouth, and tongue cases, interstitial filtered radium into the primary lesion is combined with filtered radium externally, usually at a distance of 3 cm. from the skin. Where bulky glands exist they have, lately, been excised and following this, the area treated by external curie therapy. The needles for the interstitial curie therapy are of 0.5 mm. platinum-iridium, are 2.7 and 3.5 cm. long, about 1.5 mm. thick and have a double eye. The lower eye is for suturing the needle to the tissue, the upper one for a thread which goes out through the mouth and is attached behind the ear. If the needle becomes imbedded in the tongue or tears out, the upper thread facilitates finding it. The needles contain 0.66 or 1 mg. radium element or if emanation is used, about double the equivalent of radon. The true focus, i.e., the length occupied by the radium salt or the gas radon is 15 or 30 mm. long. One needle is allowed per cubic cm. of the lesion and the irradiation is continued for eight days. A total of 1500 to 3500 mc-hr. are thus given according to the size of the lesion. The mouth is kept clean by daily irrigation with water, salt, or very weak potassium permanganate solutions. The external irradiating foci are placed on moulages made for each individual case, and the radiating field extends beyond the clinically appreciable limits of the cancer and its metastases. The moulages are made of a mixture of beeswax, paraffin and wood pulp. This softens at 48°C., and can be sterilized at 120°C. and used again. It is free from metal and does not give any secondary radiation. Its 3 cm. of thickness acts as a diffusor for the radiation, maintains the radiating foci in place and at a uniform focus skin distance throughout.[1] The large radiation entrance field increases the secondary rays in the deep tissues and augments the depth dose. For filtration they use 1 mm. of platinum or 2 mm. of lead. The radiating surface on the moulage is measured and 132 to 396 mc-hr. per square centimeter are given. The external irradiation takes eight to ten days; it precedes or follows the irradiation of the primary lesion. Simultaneous external and interstitial irradiation is avoided, as it was found that this practice was followed by radionecrosis surrounding each radium needle, due to production of secondary beta rays from the platinum.

This method of combined interstitial and external curie therapy for intraoral carcinoma has been in use at the Radium Institute since 1920. There were 186 cancers of the tongue treated by this technique from 1920 to 1923. Of these 9 died of intercurrent diseases within three years of treatment; 2 were lost sight of, and one interrupted the treatment against advice, leaving 174 traced cases in whom the treatment was carried out. Of these, 93 were either unimproved or improved only for a short period.

In 39 of the remaining 81, the primary lesion was healed, but they died or were dying from neck metastases at the time of this report.

Forty-two patients, of whom many had neck metastases, some even bilateral, were clinically well one to five years after treatment; 50 per cent of them had been operable, 34.3 per cent had been borderline cases, and 10.3 per cent had been inoperable. In 30.1 per cent the primary growth was located on the anterior portion and in 20 per cent on the posterior part of the dorsum and sides of the tongue; while 17.4 per cent originated on the inferior surface or floor of the mouth.

[1] Lately they have increased the focus skin distance of the radium on the moulages from 3 to 4 cm. by inserting a 2 cm. thick layer of cork between two 1 cm. thick layers of wax.

SUMMARY.

1. The combined use of filtered interstitial and external curie therapy as carried out at the Radium Institute of Paris, France, is of distinct value in the treatment of intraoral carcinoma.

One hundred and seventy-four cancers of the tongue, with and without unilateral and bilateral neck metastases, were treated by this method.

The primary tongue lesion healed in 63.1 per cent operable and in 46.5 per cent of all cases; 24.1 per cent of all cases not only had the primary lesion healed, but also were clinically free from neck metastases or any other sign of cancer from one to five years after treatment.

2. The irradiation should be preceded by cleaning up of intraoral infection. It should be planned so as to permanently arrest the disease during the first radiation treatment and this radiation treatment should occupy between two and three weeks.

I wish to express my appreciation to Prof. C. Regaud and his associates at the Radium Institute for their courtesy in permitting me to use their material in preparing this paper.

ABSTRACT OF DISCUSSION ON PAPERS OF DRS. GRIER, SIMPSON, SCHREINER, AND LENZ

Dr. George E. Pfahler, Philadelphia. The treatment of carcinoma of the mouth has been a very difficult subject at all times. I am using my radium needles less and less for insertion into the tissues. As recommended by Dr. Grier, I am using surface applications more and more, and you will remember that Dr. Regaud said last year "we are using surface irradiation more and more," and I believe that is what all of us will come to ultimately. We have had our best results in carcinoma of the mouth by surface irradiation. I do not believe we can lay down any rules and say every case must be treated in the same way, but must try to find the treatment that suits the individual case. Our practice has been to make surface applications inside the mouth, using gamma radiation and not depending upon beta radiation, and externally we use at least 2 millimeters of lead for filtering. As a matter of fact, for the surface application externally, we have been using the radium in the needles, the walls of which are approximately 4 millimeters thick, the millimeter of brass of the capsule and then the lead, all of which is equivalent to a little more than 2 millimeters of lead. In a general way we have been carrying out the treatment as recommended by Professor Regaud and described by Dr. Lenz. Externally, from 10,000 to 20,000 mg-hr. of gamma radiation are distributed over the glands of the neck, and we are seeing results that we have never seen before. We have made up just the same sort of wax material for the casts. It is often difficult to manipulate a mould 3 centimeters thick, so we commonly make the mould 1 centimeter in thickness and then build it up with felt to make up the 3 centimeters. This is not quite so heavy and gives us the same filtering value. The filtration is taken care of by the one centimeter.

We also employ high voltage roentgen rays, depending upon circumstances and location. We carry the irradiation over a period of about three weeks, as was recommended by Professor Regaud and described this afternoon. I believe we are all coming to the idea of prolonged irradiation rather than massive doses within a short period of time. We are not going back to the small fractional doses over one or two years, but we are prolonging a single treatment over two or three weeks, during the period in which the cells are struggling to reproduce themselves. I feel that I know more about high voltage roentgen rays than I do about radium, and with high voltage roentgen rays we try to keep the radiation at the point of saturation. We speak of this as the erythema dose and bring the radiation up to this over a period of two or three weeks, usually three.

This method is new and I have not described it before. It should be applied very cautiously. If we apply 100 per cent of the erythema dose at one time, we have learned from experience that we can repeat this in from eight to twelve weeks, depending upon whether we use 1 mm. or 0.5 mm. of copper as a filter. You will find that at the end of fourteen days your radiation has decreased in its effect to about 50 per cent, and you can repeat 50 per cent of the dose. In four weeks you could repeat 75 per cent of the dose. We have been able to plot a curve which will show the maximum amount of radiation that can be given over a period of two or three weeks without going past a safe erythema dose. We have been, perhaps, fortunate, but so far we have had no bad results. I realize that someone may start out and pile up the radiation too much and get a bad necrosis, but the problem can be worked out so that we can safely carry out the intensive

irradiation and prolong it during the complete period of activity of the cells.

Dr. W. H. Cameron, Pittsburgh, Penna. We must learn that when a case has gone beyond the stage where we can accomplish anything by irradiation, to add further treatment is only adding to the patient's already intolerable condition. We all agree that we must accomplish our result at the first treatment and not be treating them over long periods of time. We have passed through many stages of varying technique. Those of us who attended the early meetings remember how Dr. Lee held his tubes in place by stitching them there. Then Dr. Grier proposed his method. Then came the use of dental compound as employed at the Memorial Hospital. We had very satisfactory results then as we are having now with later methods. You will remember how the late Dr. Boggs literally peppered the glands with the screened needles, and he was able to show very many good results and very many failures. When sloughing occurred, he would fulgurate the area. We remember how Dr. Pfahler would fulgurate the area before he put his needles in. Then came the use of the emanation seeds of one and two millicuries and the terrific reactions which followed that procedure. So far as I can see in the literature in this country and abroad the results are about the same today.

Dr. Henry K. Pancoast, Philadelphia. The mouth is perhaps one of the most important fields for the radiologist, and it will remain so whether surgery increases in its efficiency or not. Therefore, it behooves us to improve our technique in every possible way.

Implantation is an objectionable procedure, to be avoided whenever possible. It is a surgical trauma, increasing the possibilities of metastasis, and increasing the dangers of infection. There are occasions, however, when we cannot avoid making implantations. In at least three cases of primary breast carcinoma which did not respond to surface applications, we used needle implantations, and I am sure that in those cases metastases were hurried. They occurred very soon afterwards in wide areas and the breast tumors began to grow very rapidly. I feel that the same thing can occur in the mouth and tongue.

In cancer of the mouth, if the lesion is deep, I do not believe that surface applications alone will suffice. We must rely upon something else and we have as our best adjunct electrodesiccation. The mouth is one of the best fields for the use of this agent. It is also serviceable in reducing the pain of severe radium reactions.

The tongue is a very different proposition. It is not only difficult to make dental compound molds for the tongue, but it is more difficult to keep them in place, and the lesions are exceedingful painful. In 3 cases after the use of bare tubes in the tongue, large areas of the tongue, including the area which had been subjected to implantation, sloughed out. In each instance the patient recovered and there was no evidence of recurrence several months after the treatment. This taught us the necessity of using weaker bare tubes, never over 0.5 millicurie.

Dr. Lenz, in speaking of the danger of infection in the mouth, brought to my mind a most unfortunate case that we had a few years ago, in which the implantation of two needles into an angioma of the soft palate resulted in hemolytic streptococcemia and death a week later from pyemia. He undoubtedly had a streptococcic sore throat just at the time we started the treatment, but the clinical evidences were not there just at the moment. Also, after electrodesiccation we must be most careful about the cleanliness of the mouth.

In the treatment of our mouth cases by irradiation, we should not overlook the fact that other procedures may be of great assistance. Surgical procedures are often to be considered for the relief of pain. These may be alcohol injections, section of the fifth nerve, and perhaps even the glossopharyngeal nerve, and rhizotomy. The latter we have found especially valuable to relieve pain resulting from enlargement of the glands of the neck, which will not be relieved entirely by section of the fifth nerve. The extraction of teeth is a most important consideration. We never hesitate to advise a patient before he goes under ether or gas that certain teeth will have to be extracted, either because they may interfere with the electrodesiccation, or because of their bad condition they may do great harm afterwards. We know that in mouth cancer bad teeth constitute one of the contributing causes. We also know that bad teeth are usually to be found in mouth cancer cases.

For metastatic cervical nodes we invariably employ roentgen-ray or gamma irradiation. If the glands do not respond or disappear and are still operable, a surgical block dissection is resorted to. We tried bare tube implantation in a series of cases with most disappointing results.

Mention has been made of the necessity for ligation of the external carotid artery. This should be given very serious consideration before it is performed. I have seen such ligations done in necks in which no block dissection was performed and the results were deplorable.

Dr. Robert P. Wadhams, New York City. The one certainty about mouth cancer cases is that most of them are coming to the radiologists.

I can express an opinion in regard to the method embodied in Dr. Lenz's paper. I have observed several patients so treated. The patients I have seen have all been in the wards at Bellevue and under good control. I have been much impressed by the small amount of pain they have had compared with the methods I have used. I cannot express my opinion as to final results but am much impressed with the greater comfort the patients have had following treatment.

I would like to ask Dr. Lenz or someone to say a word about leucoplakia. I have seen several cases in which carcinoma has developed on leucoplakia of the tongue. In my experience I have found leucoplakia very resistant to treatment by radium. I have not seen it treated by electrodesiccation but should think it would be preferable treatment.

Dr. J. D. Morgan, Philadelphia. While we are particularly interested in radium, I feel with Dr. Pancoast that we should not let the occasion go by without emphasizing the great value of electrothermic agents in these mouth cases. No one would think of treating mouth carcinomas by electrothermic agents alone, and radiation in some form is very essential. We have been using the high voltage roentgen rays in a manner somewhat similar to that described by Dr. Pfahler. The immediate effects have been extremely encouraging and promise well. A case of tongue carcinoma sent to me a short time ago was said to have had all the radiation he could stand and had, therefore, arrived at a saturated condition. He was a moral and physical wreck, suffering intensely. The floor of the mouth was indurated. It was impossible to do an operation so I gave him three minutes twice a day with the short length waves. That was three months ago. The man has been back at work for two months and I saw him the other day in excellent condition. I have seen other cases, in which no previous radiation had been given and similar small doses were applied with equally happy results. I just mention this as being along the lines of Regaud's recommendation of small doses over a long period.

Dr. Grier (closing). I expected to be classed as a back number for advocating contact applications. It has required a great deal of fortitude on my part to continue this during the period through which we have passed when such enthusiasm was expressed for the insertion of needles. It is a great comfort to have men of the standing of Dr. Pfahler and Dr. Cameron also advocate contact application.

Dr. Simpson (closing). I suppose none of us will agree on the exact technique to be used but it is of advantage to get together and try to check up our own methods. I do not believe that small doses in the mouth, applied for a long period of time, is good treatment.

For carcinoma of the tongue I am sure that the application of radium by surface application is poor treatment, and the best procedure I have seen is the infiltration method with bare tubes. I do not believe that anyone will ever report a good series of cases from surface application.

As to surgery of the neck, from the cases we have seen reported by surgeons who tell the truth, I think the carcinomas of the submental variety are never favorable. I think none of them get well, and if they do not get well, why operate on them?

Dr. Schreiner (closing). To speak of cancer of the oral cavity as a whole and to draw conclusions from any one method of treatment to apply to the whole is not correct. We all know that in carcinoma of the tonsil we get fairly good results; that inside the cheek the results are about 30 per cent of clinical healings. Antrum cases are quite another problem and the floor of the mouth is still another.

In regard to Dr. Pfahler's dose, I have been for a year working on this problem in an experimental way, based on an erythema dose which, as you know, will in twelve hours cause the skin to redden. This will subside, and about the twelfth or fourteenth day there will again be redness which will last for about a week, and at the end of six weeks there will be another exacerbation. Keeping this in mind and then plotting a curve, we have been experimenting clinically in the division of doses of roentgen rays and radium. The idea of obtaining saturation would be to try to prolong the skin erythema dose which comes twelve to fourteen days afterward, and instead of this try to maintain the same thing over three weeks or longer. We have been slow in gradually accumulating data. With the roentgen ray we have given 20 per cent, skipped a day and given another 20 per cent, and we have found that we can safely apply from 25 to 30 per cent more radiation in the period of one week, and 50 per cent if it is distributed over two weeks. I made reference to this at the state meeting of the New York Society a month ago and the details will be published shortly by Dr. Stenström and myself.

Dr. Lenz (closing). The radiation which is used at the Curie Institute is only gamma

radiation. When there is a lesion that extends to the base of the tongue, I do not see how you can get sufficient radiation from the surface application to reach the depth of 3 cm. I have not had any experience with the moulded applicators of Dr. Grier, but I do not see how sufficient radiation can be obtained. Therefore, I believe that interstitial irradiation, provided it is filtered, is the best method. For the superficial lesions of the mouth the method which one can use best is the best one to use.

Dr. Pfahler referred to the weight of the moulages. They are heavy but when one has watched these people and has seen them walk around with this high collar one knows that they are comparatively comfortable. If the mouth is kept clean they can stand the irradiation for three weeks without difficulty.

The epidermicide dose, to which extent they go at the Curie Institute, is much greater than the erythema dose. There is an absolute shedding of the epidermis, leaving a raw area. Three or four weeks later this area has been covered by epidermis growing in from the sides.

ROENTGEN STUDY OF FIVE HUNDRED CHILDREN FOR THYMIC ENLARGEMENT*

BY C. WINFIELD PERKINS, M.D.

NEW YORK CITY

THE modern indiscriminate method of operating upon children of all ages for adenoids and diseased tonsils without preliminary roentgen-ray exploration of the chest for possible enlarged thymus and other chest pathology seems to be unwarranted. How frequently we hear of a sudden death of a child, either in a physician's office or in a hospital during an operation or even several days after operative procedure, the death having occurred without known cause in an apparently healthy child. Post mortem examination often reveals an enlarged thymic gland, even though the patient may not have presented previous clinical symptoms of this condition. That the life of an apparently normal child can be suddenly snuffed out without known cause is

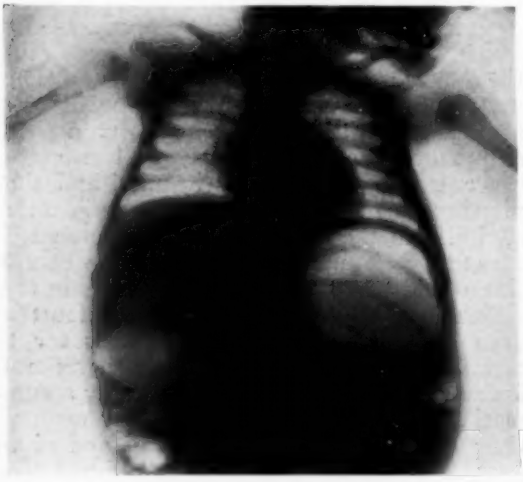


FIG. 1. Normal heart and thymus in a child aged two months.

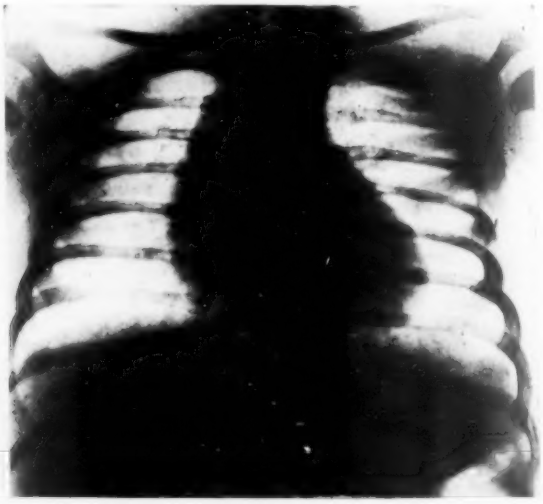


FIG. 2. Normal heart and thymus in a child aged three months.

* Read at the Twenty-sixth Annual Meeting, AMERICAN ROENTGEN RAY SOCIETY, Washington, D. C., Sept. 22–25, 1925.

alarming and of grave professional concern.

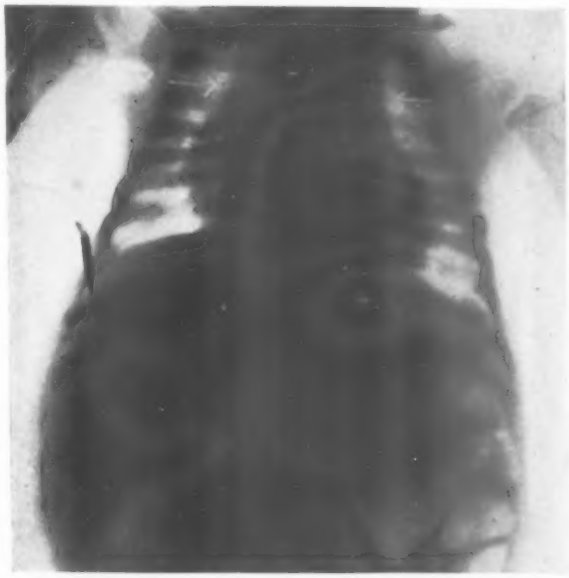


FIG. 3. Thymic enlargement in a child aged three and a half months.

The Seaside Hospital of St. Johns' Guild, New York City, presents a fertile field for heart and chest examination of children, whose ages vary from a few days to twelve years. During the past five summers, 1000 cardiac roentgen-ray examinations have been made for the cardiac clinic, and during the last two seasons, 500 examinations have been made to detect possible thymic enlargement in tonsil and adenoid patients. As a result of our investigations a standard rule is posted that no tonsil and adenoid cases shall be operated upon, or any child be operated upon, unless prior to such operation the chest is examined for cardiac, thymic or chest pathology.

In the summer of 1923, 600 operations were performed for the removal of adenoids and diseased tonsils; at that time no systematic roentgen examination of the patients was made prior to operation. One patient, a boy of four years, apparently healthy, died suddenly under primary anesthesia and the post mortem showed a very large thymus gland weighing 54 grams. In the summer of 1924, systematic examinations were made of three-fourths of all cases operated upon. With a record of 237 patients examined, the results showed 10 cases with thymic enlargement and 8 other suspicious cases.

The fact that a child may have an enlarged thymus, which is not accompanied by the characteristic symptoms of stridor, cyanosis, unconsciousness, asthma and respiratory difficulties is fraught with grave consequences, especially when operative proceedings are contemplated, for such patients are prone to sudden death under anesthesia. Kerley and Graves in their recent textbook, 1924, state: "It is well proved by a long series of cases carefully studied, by competent observers, that the condition known as Status Lymphaticus is an entity, which is characterized clinically by a lowered vitality or unstable equilibrium of vital forces, so that accidents or disturbances otherwise unimportant, such as some slight injury or light anaesthesia may precipitate a failure of the heart or respiration . . . Autopsy findings in these subjects usually show a general lymphatic enlargement of the tonsils and follicles at the base of the tongue and in the intestines, and

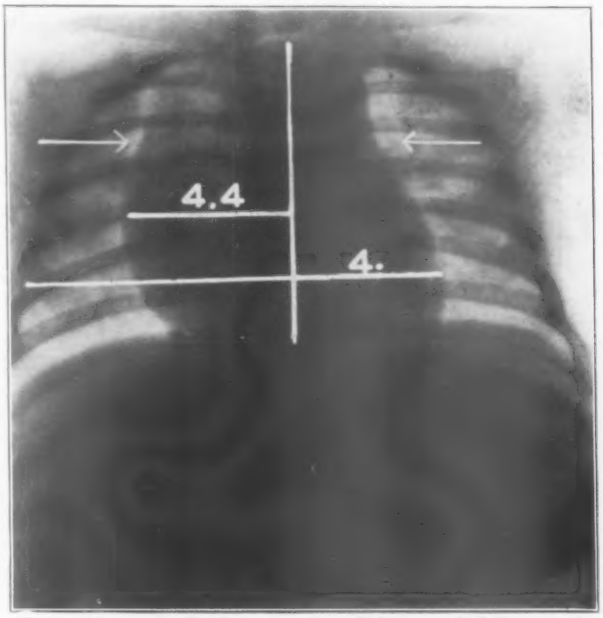


FIG. 4. Hypertrophied thymus in an infant aged eight months; arrows point to the enlarged gland.

swelling and enlargement of the thymus, especially at an age, when it has generally disappeared . . . Many of the sudden deaths, occurring during chloroform and

FIG. 5. Congenital heart in an infant aged three months. Note narrow base of the heart. This patient had marked cyanosis and stridor, with respiratory difficulties, and the case was mistaken for one of an enlarged thymus before roentgen examination was made.

ether anaesthesia have proved to be due to Status Lymphaticus." That tonsil and adenoid subjects are prone to enlarged lymphatic structures, such as the thymus, is well known, especially at an age when it should have disappeared. Many of the sudden deaths during chloroform and ether anesthesia have occurred in patients with an enlarged thymus.

Gwathmey, in his recent book on "Anaesthesia" states: "In extremely rare and unusual cases of Status Lymphaticus, in which the organs may be diseased and anomalous . . . it is quite conceivable that the heart may be paralysed before respiration ceases. When paralysis occurs from the condition, it is usually, in primary anaesthesia." "Until within recent years, it has been the custom to administer chloroform to children. A number of deaths have been reported of children dying two or three days after the administration of chloroform and post mortem examination revealed that these children had what is known as 'Status Lymphaticus.'"

The clinical evidences of this condition do not permit of its detection beforehand, but the anesthetist will be wise to be particularly on his guard when the patient is a child or young adult of slight physique, pale complexion or with large adenoids and tonsils. A majority of writers agree that a positive diagnosis during life is difficult. Cocks considers a roentgen-ray examination second only to the general condition of the patient in making a diagnosis. Halsted points out the great danger of operation for adenoids and tonsils upon children with status lymphaticus, on account of the great shock from fright and violent struggle which in some cases precipitates death.

The association of sudden death with thymic enlargement was known 250 years ago as the result of Morgagni's researches.

FIG. 6. Normal heart and thymus in a child aged three years.

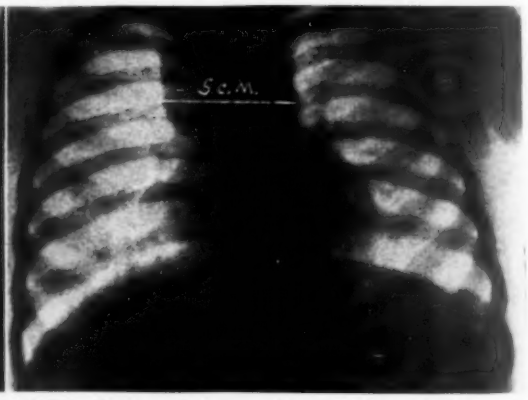


FIG. 7. Enlarged thymus in a child aged three years. Note bulging shadow at base of heart.

Lee, in 1842, and Howland, in 1907, refer to sudden death due to laryngeal spasm and asthma in children; however, the roentgen investigation of the chest for thymic enlargement is of comparatively recent origin. Congenital enlargement of the heart with the attending clinical symptoms of stridor and cyanosis has been at times confused with thymic enlargement, and it is only by roentgen-ray exploration of the chest, that a differential diagnosis can be made between the two diseases. The roentgen investigation of the chest in infants and children presents many differences in shadows from that encountered in the adult, such as enlarged mediastinal shadow, small area of the lungs and narrowness of the ribs. The technical difficulties not encountered in the adult must be surmounted, the most important of which is the lack of cooperation of the patient. Our experience teaches us that when dealing with children and especially infants, exposures should be made in the shortest possible time and that they should be taken on either respiratory impulse; in other words, when you can get them. A teleroentgenographic plate is always made, as this method is of distinct advantage in procuring a less distorted view of the anatomy of the chest. It requires expert technique to get good diagnostic chest roentgenograms of infants and children; moreover, it often requires great patience, tact and ability on the part of the technician. This is a feature of roentgenology which is seldom appreciated by the physician not doing roentgen-ray work.

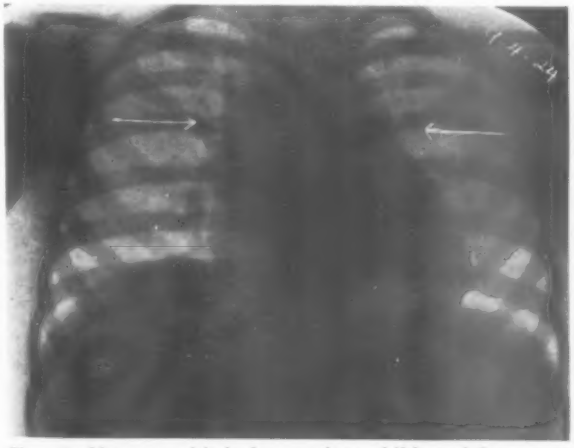


FIG. 8. Hypertrophied thymus in a child aged five years. This patient is a sister of the one represented in Figure 7.

In newborn infants and young children with cyanosis and respiratory difficulties, an enlarged or persistent thymus should always be considered. The roentgen examination of the chest may show not only an enlarged thymus but it will possibly give evidence of any pathology in the heart or lungs. The diagnosis of the thymic enlargement is not free from possible error, for the enlarged gland may be placed so low over the heart, that the two organs apparently fuse and the roentgen ray will not demonstrate a mediastinal smooth bulging silhouette at the base of the heart, characteristic of an enlarged gland. The film may show also a large shadow at the base of the heart during expiration, but not on inspiration.

In recent investigations, E. T. Evans[3] states that the persistence of the thymus gland as a relatively normal condition has been demonstrated, although a positive roentgen finding is not always in evidence, but cessation of the symptoms are frequently noted after roentgen treatment. Many sudden deaths of children *formerly supposed to be due to bronchopneumonia*, congenital anomaly of the heart or acute intestinal indigestion, in which autopsies have given little information as to the cause of death, may have been due to

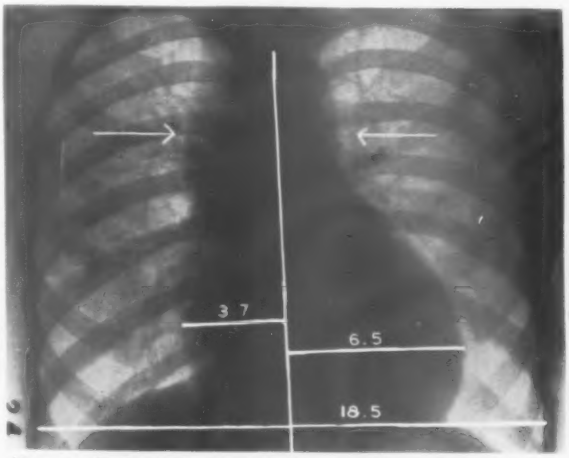


FIG. 9. Enlarged thymus in a child aged nine years. Note diminution in size of the gland as patient grows older.

unrecognized thymic hypertrophy. Such types of cases have recently been examined, considering the possibility of thymic enlargement, in spite of possible negative roentgen findings, treated as such with the roentgen ray with happy results and the disappearance of the cyanosis and dyspnea. The presence of an enlarged thymus in older children, as compared with the newborn and infants, is not so dominant. However, a sufficient number of older children do possess this pathological state, and a rigid clinical and roentgen examination should be made before operative procedure, that a possible collapse and sudden death may be forestalled.

FIG. 10. Patient had a low placed enlarged thymus which did not show in the roentgen examination. This child, whose age was four years, was operated upon and died in the primary stage of anesthesia.

During the summers of 1924 and 1925, in a series of 500 tonsil and adenoid patients, whose ages were from birth to twelve years with a general average of six years, 25 definite cases of thymic enlargement were found. A number of other cases with suspicious broadening at the base of the heart were observed, but we have only recorded what seemed definite enlargements. The positive cases were not operated upon, but those who remained in the hospital were treated by roentgen rays for the enlargement. One patient who did not show an enlarged thymic shadow either roentgenographically or clinically died suddenly under primary anesthesia. The subsequent post mortem examination proved that the hypertrophied thymus was lying low over the heart. Therefore in the roentgenogram the silhouette could not be visualized because of the apparent fusion of the two shadows. The thymus in this patient weighed 39 grams. Although the enlargement did not show roentgenographically, the exception in this patient does not prove the rule.

Many broad chested children under three years of age as a rule show a wider base of the heart. This broad base should not be confused with thymic hypertrophy, unless other clinical signs should warrant a diagnosis. In at least 1500 chest examinations of children and infants during the past four summers, we have observed the above appearances. The roentgen examination of the chest may differentiate between a negative and positive thymus

FIG. 11. Shows anterior and posterior views of the post mortem findings of the patient shown in Figure 10. Very large thymus weighed 39 grams. The gland was situated so low over the cardiac shadow that it could not be seen during the roentgen examination.

by a continuous dense shadow above the case of the heart parallel with the spine. This shadow bulges to the right or left of the median line, the size of which indicates the extent of enlargement of the gland. It is our experience with many hundreds of chest and cardiac examinations during the past four summers at the Seaside Hospital, that an enlarged thymus does not exist as often as claimed by some authorities. (The surgical treatment of enlarged thymic gland, on account of its high mortality, has been superseded by roentgen-ray or radium treatment, which is safe and satisfactory in the majority of patients.)

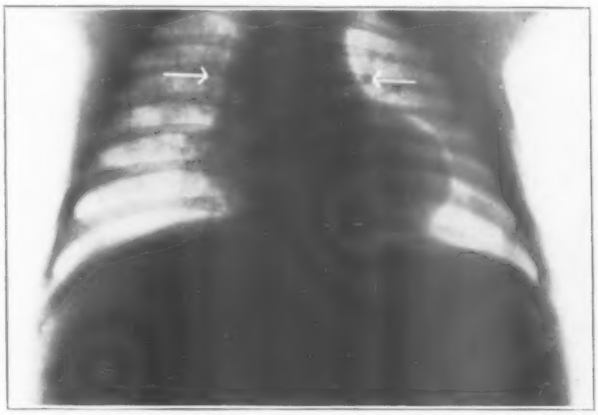


FIG. 12*a*. Enlarged thymus in an infant six months old.

This paper has been formulated largely from ideas entertained as the result of the unfortunate outcome of treatment in the patient, whose following history I will describe.

E. H., aged four, admitted to the Seaside Hospital Orthopedic Service on August 5, 1924. Physical examination revealed a pale, poorly nourished child with rickets. The child was built up and gained two pounds. The roentgen examination of the thymic region was negative. Three weeks later the child was prepared for operation to correct the rachitic deformities, such as knock-knees and anterior bowing of the tibia. While under primary anesthesia, the patient suddenly ceased breathing without warning, and all efforts to resuscitate the patient were unavailing.

Postmortem Findings. The gland was very large, weighing 39 gm. (normal 8–15 gm.). It extended downwards two-thirds the distance over the pericardium like an apron. A general hyperplasia of the gland of the mesentery was also noted. The enlarged gland was low over the pericardium; so low, that the shadow could not be differentiated from the heart in the roentgen-ray examination.

CONCLUSIONS

1. All children before operative procedure should be studied both clinically and roentgenologically for enlarged thymus.

2. Sudden death without previous clinical symptoms may result in patients with enlarged thymus from primary anesthesia or mild shock to the system.

3. Congenital anomaly of the heart and thymic hypertrophy can be differentiated by roentgen examination, although the symptoms may simulate one another.

4. All children under three years of age present a broad base of the heart, which should not be confused with an enlarged thymus.

5. An enlarged thymic gland may be placed so low over the pericardium, that it will not cast a characteristic shadow, when examined by means of the roentgen ray.

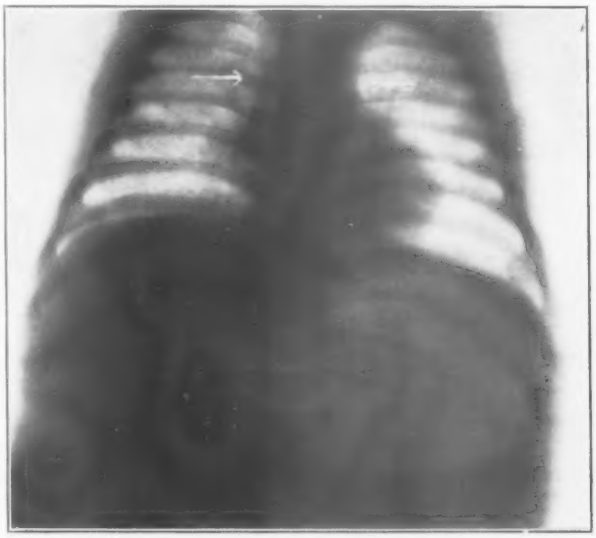


FIG. 12*b*. Shows reduction in size of the gland in patient represented in Figure 12*a*, after one roentgen-ray treatment.

6. Roentgen radiation presents a satis-

factory method of treatment of enlarged thymus.

REFERENCES

1. KERLEY and GRAVES. Pediatrics, 1924, pp. 471–473.
2. GWATHMEY. Anaesthesia, 1924, pp. 247 and 326.
3. EVANS, E. T. Critical study suggesting persistent large thymus as the cause of cyanosis in newborn infants. *Surg., Gynec. & Obst.*, 1924, xxxix, 494–498.
4. PERKINS, C. W. Roentgen cardiac studies in children. *Radiology*, 1924, ii, 367–373.
5. PERKINS, C. W., and HARTSHORN, W. M. *X*-ray studies of cardiac diseases. *N. York M. J.*, 1923, cxvii, 268–273.
6. PERKINS, C. W. Röntgen studies and treatment of enlarged thymus in children. *M. J. & Record.* (*Supp.*), Apr. 15, 1925, cxxi, 487–490.
7. GRIER, G. W. Diagnosis and treatment of enlarged thymus. AM. J. ROENTGENOL. & RAD. THERAPY, 1924, xi, 141–146.

A METHOD FOR ESTIMATING THE SIZE OF THE THYMUS*

BY F. O. COE, M.D.

WASHINGTON, D. C.

INTEREST in thymic enlargement has a certain periodicity, the maximum interest usually following the report of a thymic death. Thus our interest in the present series was instituted by such an accident. The present report is based on the study of cases at Children's Hospital referred for roentgen diagnosis. The report includes 40 cases which were reported as enlarged thymus, by Dr. E. A. Merritt and myself, and 81 cases in which the thymus was reported as not enlarged, or cases which were referred for chest examinations and reported negative.

Nearly all of the more recent cases were referred by Dr. Claud and this study was undertaken in conjunction with him. No attempt is made to obtain the percentage of cases that show thymic enlargement.

ROENTGEN TECHNIQUE

The diagnoses in all cases were made from roentgenograms. The child was stripped to the waist, the arms and legs held, and the patient held firmly in as nearly a prone position as possible. In order to get the exact anteroposterior view, one lead arrow was placed on the spinous processes of the vertebrae and another arrow parallel to it on the sternum. The shadows of these should coincide on the film. The smaller children were made to cry lustily and the film was taken when the child held its breath. This is done in order to enlarge the thymic shadow by engorgement of organs above the diaphragm and by the elevation of the diaphragm. The exposures were all made at 36 in. tube film distance, $3\frac{1}{2}$ in. spark gap, and $\frac{1}{20}$ to $\frac{1}{10}$ sec. exposure.

ROENTGEN DIAGNOSIS

There is considerable variation in the thymic shadow. It occupies the upper mediastinum and extends downward over the aorta and the base of the heart on both sides of the vertebral column. The lateral borders are convex. In a typical case the thymic shadow is spoken of as having the appearance of a fez on top of the heart. The shadow is always widest just above the heart shadow and becomes narrower as the inlet of the thorax is approached.

Lymphadenitis of the upper mediastinum somewhat resembles an enlarged thymic shadow, although usually the shadow of lymphadenitis is concave laterally and is not widest above the heart.

In this study an attempt is made to show the normal variations of the supracardiac shadow and what should be classified as enlarged thymus.

* Read at the Twenty-sixth Annual Meeting, AMERICAN ROENTGEN RAY SOCIETY, Washington, D. C., Sept. 22–25, 1925.

METHOD OF STUDY

All cases that had been previously reported from roentgen examinations as "enlarged" were re-studied and measured, and these, with the recently studied cases make up a total of 40. The ages range from two months to eleven years. The internal transverse diameter of the chest was measured in centimeters at the juncture of the second rib and the sternum. At the same point the transverse diameter of the supracardiac shadow was measured. Then the ratio of the supracardiac shadow to the internal diameter of the chest was expressed in percentage.

In order to get a normal curve, similar measurements were made on chests of 81 children between the ages of two months and eight years, referred for enlarged thymus or pulmonary pathology and found to be negative. It will be noted from the diagrams and curves that they are somewhat irregular. This was due to an occasional normal being classed as enlarged, and an occasional enlarged being placed in the normal class. If that patient happened to be the only one of that exact month, it ran the average up or down, as the case might be. Although complete records were made of all cases the curve of percentages shows only the averages.

The measurement of the normal supracardiac shadow is 32 per cent of the transverse thoracic shadow at three months and averages about 35 per cent up to twenty months, when it declines to 30 per cent at thirty months and stays at 30 per cent up to six years, when it gradually declines to 25 per cent at eight years; the records on 40 cases between eight years and twelve years show that it averages 25 per cent.

In contrast to this, the curve of the enlarged thymus is 43 per cent at two months, stays above 45 per cent until about the third year when it descends to just above 40 per cent, and stays near 40 per cent for two years. Gradually it declines until it is 32 per cent at seven years.

Hence the normal ratio of the supracardiac shadow to the internal transverse diameter of the chest at the angle of Louis is about 1 to 3, until the sixth year, and if this is found to approach or exceed 1 to 2, the thymus is enlarged.

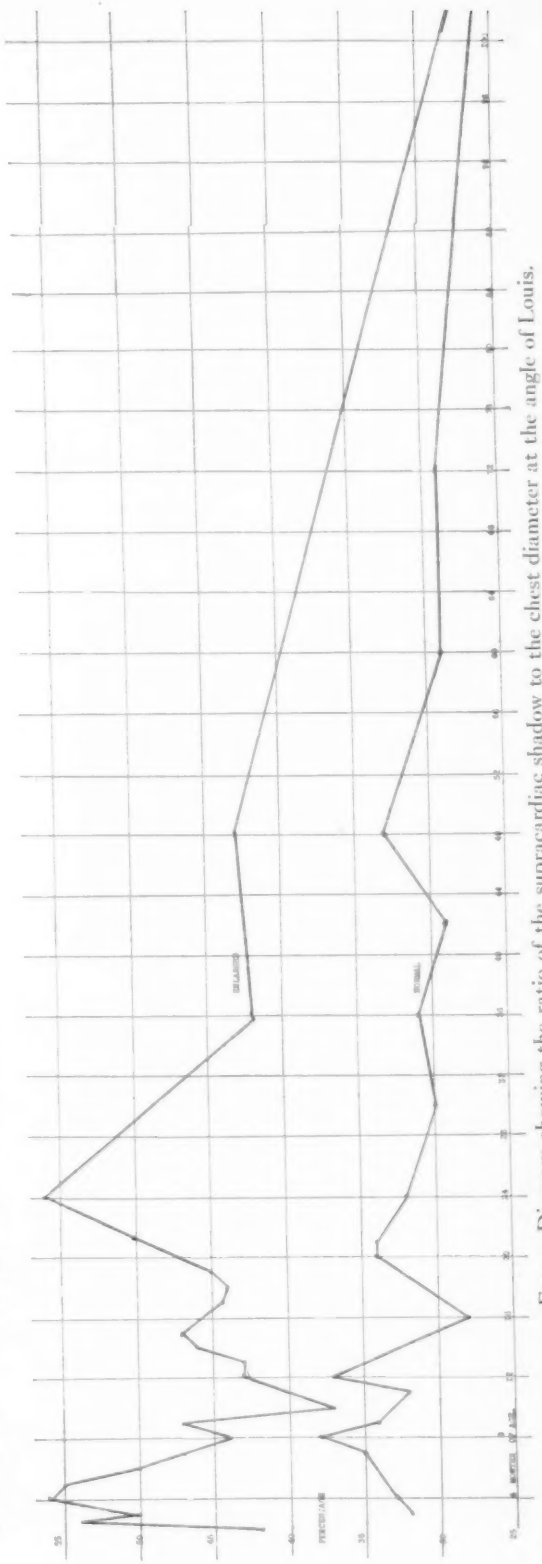


FIG. 1. Diagram showing the ratio of the supracardiac shadow to the chest diameter at the angle of Louis.

THE SIMILARITY OF THE ROENTGEN FINDINGS IN MULTIPLE MYELOMA AND IN SPOROTRICHOSIS*

BY WALTER ALTSCHUL, M.D.

German University of Prague (Clinic of Professor Schloffer)

PRAGUE, CZECHOSLOVAKIA

THERE have appeared in Volume XII of this Journal two papers on multiple myeloma: the first by Whitlock[1] and the second by Stone.[2] There is no need to go into all the details of the disease picture, which have already been adequately discussed by these authors; but we shall concern ourselves here only with the roentgenograms of the skull which illustrate these papers.

In each instance, the cranial picture is placed first as the most characteristic feature. In fact, there is not one of the ordinary bone diseases which calls forth a similar picture. Gummas of the skull and sarcoma metastases would have to be considered in making a differential diagnosis. Cranial gummas, however, produce more sharply outlined rarefactions, somewhat resembling punched-out holes, and in addition they do not occur in such great numbers. Sarcomas destroy the bone to a more extensive degree than do myelomas so that the intact bone islands (which are clearly visible in both illustrations) disappear and a more diffuse rarefaction finally results. A sarcoma of this type is shown in Figures 1 and 2.

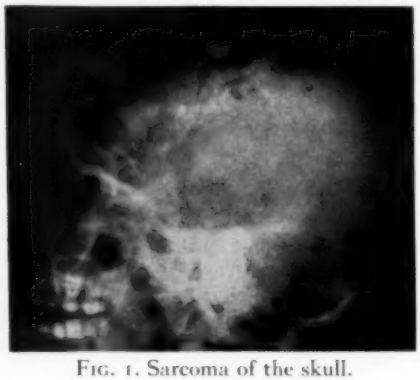


FIG. 1. Sarcoma of the skull.

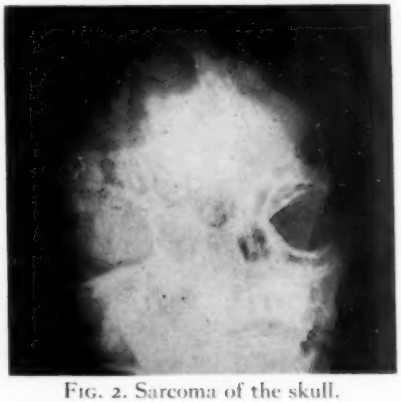


FIG. 2. Sarcoma of the skull.

I should like to call attention to a roentgen picture of the cranium which is almost entirely identical with those described in the above mentioned papers, but which was caused not by myeloma but by an extremely uncommon disease, namely, sporotrichosis. I shall proceed at once with the history of the case, the roentgen pictures of which have already been presented by Reiser at the second meeting of German Roentgenologists and Radiologists of Czechoslovakia, Prague, October, 1924.

CASE HISTORY

A woman, aged sixty-two, who had previously been in good health, complained for the past year of pain in the left lower jaw, especially when opening the mouth wide. As time progressed, the jaw swelled slowly but continuously and the patient submitted to a roentgen treatment in a provincial hospital. As this treatment was without effect, she presented herself at our clinic on December 7, 1920.

There was a hard, immovable tumor originating in the left mandible; and because of its continuous growth it was regarded as malignant. Clinically, there were no other pathologic findings. The roentgenogram shows distention of the lower jaw by several sharply

[1] Whitlock, S. B. Multiple myeloma, with case report. AM. J. ROENTGENOL. & RAD. THERAPY, 1924, xii, 331–335.

[2] Stone, Willard J. Multiple myelomata. AM. J. ROENTGENOL. & RAD. THERAPY, 1924, xii, 543–545.

* Translated by B. Cohen, Ph.D., Washington, D. C.

outlined areas of rarefaction which give the impression of a multilocular bone cyst (Fig. 3). The Wassermann reaction was negative. A portion of the tumor was removed for examination, and the report from the pathological-anatomical institute of the German University of Prague (Professor Ghon) follows:

There are no changes in the suspected tumor tissue which can be interpreted as a specific granuloma; and there are no other special alterations. In the pieces of tissue labeled "tumor mass scraped from the bone" there is present a fibrous osteomyelitis, which in certain areas is crowded with a cellular infiltration consisting of some small, lymphocytoid round cells, and fibroblasts, but consists largely of large mononuclear cells (with a dense nucleus), some of which because of their size could be regarded as giant cells. Although certain areas with definitely large mononuclear cells suggest tumor, yet on the other hand, the general picture of the change does not contraindicate a specific granuloma.

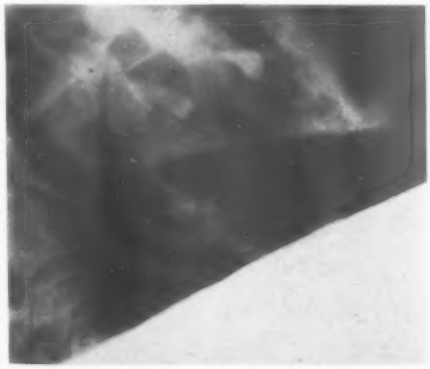


FIG. 3. Sporotrichosis involving the mandible.

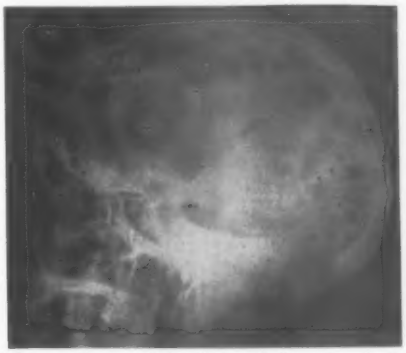


FIG. 4. Sporotrichosis involving the skull.

Bacterial forms could not be demonstrated in the Gram-Weigert sections.

In cultures made from the blood and from tissue smears there appeared after several days, in addition to colonies of Gram-negative rods and Gram-positive cocci, numerous colonies corresponding macroscopically to those characteristic of sporotrichosis, and consisting of Gram-positive fungi, which were morphologically similar to those of sporotrichosis.

In January, 1921, about a month later, pain appeared in both legs; and on the forehead in the vicinity of the glabella a hard, nut-sized tumor developed, which was followed after a while by the appearance of similar tumors in various parts of the cranium. The roentgenograms taken at this time gave the following findings: The second lumbar vertebra has two somewhat diffuse areas on the right side, and it is very much narrowed above, especially to the right where the foci are located. The roentgenogram of the skull (Fig. 4) shows the entire cranium studded with large and small areas of rarefaction, some of them circular and others of a more oval contour so that, taken as a whole, there results a picture which looks as if the entire bone had been chewed out by a tumor mass.

The woman suffered from a frequently recurring facial erysipelas. The metastases in the skull increased rather rapidly, and she declined more and more. All therapeutic efforts were ineffective. Neither high doses of iodine nor a roentgen irradiation produced any change in the course of the disease. In June, 1921, during the night following a test excision there developed a fistula in the lower jaw from which oozed a thin, glairy, grayish yellow pus. At the same time, an abscess also appeared at the sternoclavicular joint. After a febrile course with increasing weakness, death supervened on July 13, 1921 (pneumonia).

Necropsy performed at the German Pathological Institute of Prague gave the following findings: Indurative lobar pneumonia in the left upper lobe, and fresh confluent bronchopneumonic foci in the right lower lobe; degeneration of the heart, kidney, and liver; splenic tumor. The exterior of the skull cap appears in many places punctured by holes, mostly circular; and through the openings there is visible grayish red and reddish tissue. On the frontal surface above the glabella and between the frontal eminences there is a rather large bone defect; and a similar one is present between the parietal bones. Through both defects there extrudes a grayish red to red mass. In the middle third of the left mandible, there is a swelling of the bone about 3 to 5 cm. in size, with bluish discoloration of the overlying skin and with an oozing fistula about the size of a pinhead.

After opening and removal of the skull cap, there are seen on the external surface of the dura mater, rather large plaques of tumor-like growth which partly erode the bone and break through the hard skull cap. The brain is hyperemic but otherwise free from change. The opening of the tumor in the right clavicular region reveals an egg-sized cavity filled with masses of pus. The clavicle itself is paper-thin in the sternoclavicular joint, eroded and fractured. The bone in each of the ribs, vertebrae and upper and lower legs shows in section reddish to grayish red masses, partly focal, and partly (especially in the right femur and in some of the ribs) filling the whole cavity. The body of the second lumbar vertebra is almost completely eroded by the tumor masses which have broken through toward the spinal canal; but these do not invade the cord or its membranes. The pelvis also shows bluish, transparent areas up to the size of the palm, which in section yield the same findings as the other bones.

Sporotrichosis is a chronic disease which is caused by the spore-forming, filamentous fungus, *Sporotrichum*, related to the hyphomycetes. The primary invasion is usually initiated by trauma. In addition to the circumscribed regional form of the disease, there is also a disseminated, a lymphogenic and a hematogenic form. In the great majority of cases the disease localizes in the skin and the subcutaneous cellular tissue, and only exceptionally are the mucous membranes, musculature, bones, epididymis and eye invaded.

The first case of sporotrichosis was published from the Johns Hopkins Hospital by Schneck. The fundamental work and precise investigation upon this disease we owe to de Beurmann and his students.[1] The histological changes are not characteristic and the demonstration of *Sporotrichum* in the tissues is extremely difficult. On the other hand, the cultural demonstration of *Sporotrichum*, which grows well on most culture media, is relatively easy. In the present case, the diagnosis was established culturally and not on the basis of the histological findings.

Although sporotrichosis of the bones belongs to the rarest of diseases, I have nevertheless considered it desirable to call attention to it in connection with the above mentioned papers in this Journal; because the apparently characteristic roentgen pictures of multiple myeloma are not always necessarily due to true tumors, since an infectious granuloma, such as for instance, sporotrichosis, can also call forth similar pictures.

[1] A comprehensive discussion with full bibliography has been published by Arndt in *Dermatologische Zeitschrift*, 1910, Volume XVII.

THE ROENTGENOGRAPHIC DEMONSTRATION OF THE TRACHEA AND BRONCHI*

BY P. M. HICKEY, M.D. AND A. C. FURSTENBERG, M.D.
Professor of Roentgenology Assistant Professor of Oto-Laryngology
University of Michigan
ANN ARBOR, MICHIGAN

IN the roentgen-ray demonstration of the trachea and the larger bronchi, we have been compelled up to this time to rely principally upon the fact that the air content permits of a fair differentiation of tissues. Frequently, the oblique position has been utilized to accentuate the shadows of these air tubes. Displacement and compression of the trachea, aside from inspired foreign bodies, were the limit within which pathological changes could be demonstrated. However, even this meager information was often valuable to the surgeons in studying enlarged thyroids. It has, of course, long been recognized that the simple air content of the bronchi was insufficient for the recognition of pathological variations in the bronchi of the second and third divisions.

Occasionally, in the examination of the gastrointestinal tract, the opaque meal would be seen to pass through an unsuspected tracheo-esophageal fistula, outlining the trachea and bronchi in a most dramatic manner. Unfortunately, these accidents were sometimes attended with considerable danger.

Dr. Chevalier Jackson, in a paper read before the American Laryngological Association in May, 1918, described the intrabronchial insufflation of the dry bismuth bicarbonate which, in the hands of the very expert, gave much valuable information. Distribution of the bismuth was not always uniform and was frequently found irritating. In selected cases, the introduction of bismuth paste into the bronchial tubes was made for the exact demonstration of limited areas of abscess formation. This procedure had certain disadvantages, inasmuch as it required the introduction of the bronchoscope, and only showed a very limited area.

Consequently, the roentgenologic world was interested in the finding of a gas or fluid which could be easily introduced into the lower air passages and which would not be irritating or toxic. Such a compound has been found recently in a combination of iodine with a vegetable oil, marketed under the trade name of lipiodol. The iodine content is said to be as high as 40 per cent, furnishing a medium of great roentgen-ray opacity. The fluidity of the preparation lends itself well to injection and its remarkable blandness permits of its free use in the lower respiratory tract without irritation or cough. Owing to the very close chemical union of the iodine with the oil, symptoms of iodism do not occur. We have not been able to detect any tract of iodine in the urine after roentgenoscopic examination has shown definite retention in the lower bronchi for several days.

To French radiologists belongs the honor of the first use of this preparation and its introduction to roentgenologic practice. Sicard and Forestier employed this iodinized oil in the study of tumors of the spinal cord. Sergent and Cottenot, Bezançon, Weil, Azoulay, Bernard, Armand-Delille, Duhamel and Marty, Nicaud Dollfus, Haret, Gelston, and others have written concerning its use in the lower respiratory tract.

The purpose in presenting this short paper is to give the writers' experience with the technique and to discuss briefly the advantages of this method of examination. As in many of our examinations, the best results are obtained by the efforts of two departments; in this case, the Department of Laryngology cooperating with the Department of Roentgenology. The average roentgen-ray worker does not possess the necessary skill in laryngeal manipulations to introduce the oil without laryngeal irritation.

TECHNIQUE

Three methods of injection may be employed:

* Read at the Twenty-sixth Annual Meeting, AMERICAN ROENTGEN RAY SOCIETY, Washington, D. C., Sept. 22–25, 1925.

1. Supraglottic injection of the iodinized oil with a curved laryngeal syringe, guided by the reflected image of the larynx in a mirror.

2. Intrabronchial injection through a bronchoscope passed into the lower respiratory tract.

3. Injection through the cricothyroid membrane by means of curved trocar or needle.

The last method was the one employed by the pioneer experimenters in this field. Specially designed trocars or needles were used. The instrument was passed through the tissues of the neck and forced into the larynx between the cricoid and thyroid cartilages. An anesthetic solution was then injected to overcome the natural protective reflexes of the trachea and the oil forced into the larynx through a syringe attachment and allowed to gravitate into the lower air passages. This technique seems to have enjoyed certain popularity because of its applicability to excitable and nervous patients and to children, whose cooperation could not be secured.

Supraglottic introduction of the iodinized oil by indirect laryngoscopy has been the method of choice in the Department of Roentgenology, University Hospital. The application of this technique is limited to adults since children are very intolerant of oral instrumentation. When practical however, supraglottic injection seems to have one important advantage over other methods, namely, the satisfactory injection of the oil without pain or discomfort. Not a single adult patient thus far has failed to cooperate in the successful completion of this method of injection.

One-fourth of a grain of morphine is given hypodermatically about one half hour before the injection is made. The soft palate, base of tongue, epiglottis and larynx are thoroughly anesthetized with a 10 per cent cocain solution, either by means of a cotton applicator or curved laryngeal syringe. Not more than 8 to 10 drops of the solution are required to render the mucous membrane surfaces exposed to instrumentation insensible to pressure. Carefully measured doses of the anesthetic are strongly recommended. That certain people have an idiosyncrasy to cocain is no doubt true. Nevertheless, this form of anesthesia has been used for intralaryngeal surgery in the Department of Otolaryngology, University Hospital, for more than twenty years without the appe rance of *serious* toxic effects in a single instance. Novocain, procain, and others, because of their less toxic qualities are frequently used for local mucous membrane anesthesia, but in the writers' experience, are unsatisfactory substitutes for cocain in laryngoscopy. Thus ten to fifteen minutes are devoted to the preparation of the patient, during which time every effort is made to secure his confidence and to enlist his cooperation.

The patient is seated erect facing the operator while light is reflected from a head mirror into the pharynx. The patient protrudes the tongue and a single thickness of towel is placed upon its dorsal surface. He is then instructed to grasp his tongue firmly between the first finger and thumb of the right hand and to draw it forward as far as possible. The laryngoscopic mirror, previously warmed, is introduced into the oropharynx with its reflecting surface directed downward and placed high up and far back against the soft palate. With the mucous membrane thoroughly anesthetized and the muscles of the pharynx relaxed, the mirror in this position affords a complete view of the epiglottis and frequently an image of part of the larynx.

A curved laryngeal syringe containing 15 c.c. of warm iodinized oil is introduced into the pharynx and its tip, guided by the reflected image in the laryngoscopic mirror, retracts the epiglottis slightly forward and comes to lie in the upper space of the larynx. A complete view of the larynx is now obtained and during quiet respiration with the vocal cords well abducted, the oil is injected. About 12 to 15 c.c. of the oil is sufficient to inject the lower air passages of one lung in an adult. The warmed solution produces little or no irritation to the respiratory mucous membrane and the entire quantity can be introduced in the average case in 30 seconds to one minute without exciting a cough reflex.

A roentgenoscopic examination is then made to determine the extent of the

injection, following which the patient is immediately roentgenographed in the vertical or horizontal position.

Because of the more vertical direction and slightly larger diameter of the right primary bronchus, the oil gravitates into the lower air passage of the right lung when the patient is erect. During the second injection which follows, the left bronchial tree is satisfactorily injected by tilting the patient's entire body slightly to the left. This deviation from the erect position does not distort the laryngeal image nor prevent accurate injection of the oil.

Recently it has been discovered that a more extensive infiltration of the lower respiratory tract can be obtained in the reclining position. The patient is placed on his back on the roentgen-ray table with a pillow under the head so that the neck is in forced flexion. Thus the larynx and trachea are placed in a more or less vertical plane so that the oil slowly gravitates down the posterior wall of the trachea when injected under the guidance of the laryngoscopic mirror. It is not necessary to insert the curved tip of the syringe beyond the vocal cords. The instrument is introduced to a point immediately above the glottis, but is not permitted to touch any part of the larynx. Failure to observe this precaution frequently results in a protective glottic reflex which renders injection of the oil impossible. Cricothyroid injection was at first the only practical method available for children. We have recently practised intrabronchial injection with considerable success and find that it bids fair to be our method of choice in the future. This technique seems to have a distinct advantage over others in that it permits the operator to directly inspect the lower air passages and to inject the oil into any part of the bronchial tree under suspicion. It is not a formidable procedure and when carefully performed causes little discomfort to the patient.

The child is wrapped in a blanket, and placed on the roentgen-ray table in a prone position with a pillow under the shoulders so that the neck is in forced extension. The tubular speculum of Jackson is introduced and the tongue and tip of the epiglottis depressed until a good view of the larynx is obtained. The latter is then swabbed with a 10 per cent solution of cocain. A Jackson bronchoscope is introduced into the trachea under vision through the illuminated tubular speculum. The passage of the larynx is the difficult part of the procedure, but with the latter anesthetized and the tube manipulated by a lever-like movement, rather than forced, the trachea is entered without injury to the patient. When the bronchoscope has advanced to the main bronchus a soft rubber catheter is passed through the tube and introduced to the desired level in the bronchial tree. The entire procedure is carried out under the guidance of the roentgenoscope. The operator advances the catheter step by step under the direction of the observer who tells him when to make the injection. When the desired position is attained a 10 c.c. syringe filled with the warm oil is attached to the catheter and the oil slowly injected. Care is taken not to move the bronchoscope while the injection is being made. It is within the upper part of the respiratory tract, the larynx and trachea, that the reflexes are the most active and any movement of the bronchoscope at this time may excite a cough which will expel the oil. The patient is immediately roentgenographed in the horizontal position with scope and catheter *in situ*. None of the patients thus treated has suffered any untoward symptoms. Following the removal of the tube the bulk of the oil is discharged with the coughing reflex. Likewise in the cases of supraglottic injection performed in adults under local anesthesia, most of the oil is expelled as a foreign body as soon as the effect of the anesthetic wears off. A small quantity of the oil, however, may remain in the lower air passages for several months.

These experiments have been accompanied by but one accident. This occurred in a child in the form of an interstitial emphysema of the neck and shoulders following the cricothyroid injection through a trocar. The condition resolved, however, with no apparent ill effects to the patient.

In the writers' routine, roentgenoscopic examination was resorted to immediately after introduction of the oil. When possible,

the patient was seated on a stool in front of the vertical roentgenoscope during the laryngeal injection. In this way roentgenoscopic observation could be made immediately after the laryngeal manipulation. We believe that this is an essential part of the complete examination, inasmuch as the visualized bronchial tree shows its greater sharpness during the first few moments after the filling with the oil. The contours of the larger bronchi and their ramifications are at first very clear cut and are as sharply differentiated as a roentgenogram of a post mortem specimen injected with bismuth paste. The sooner the roentgenogram is made, the better the result. While the pouring of the oil over the bronchial mucous membrane does not seem to produce any irritation, still the natural reflex from laryngeal manipulation may quickly manifest itself. We would, therefore, consider it of the greatest importance to systematize the technique of roentgenoscopy and roentgenography so that there will be the least loss of time. The further advantage of the roentgenoscopic examination lies in the fact that the eye will follow the movements of the bronchi as agitated by the heart action, whereas in the roentgenogram there will be a certain amount of blurring unless the films are exposed for only a very small fraction of a second.

A striking feature of the roentgenoscopic examination of the visualized bronchi is their comparative immobility. Ordinarily, in looking at the chest roentgenoscopically we are struck by the movement of the diaphragm. The bronchial tree when not visualized is inconspicuous, but when it contains the oil, the immobility of the bronchial tree as compared with the marked excursion of the diaphragm is quite vivid. Lateral observation of the visualized bronchi shows their anatomic position very well and dramatizes the extent to which the bronchi show below the level of the summit of the diaphragm.

After the sharp outline of the lower bronchial tree is first seen in the roentgenoscope, the injected oil has a tendency to pass into the very small ramifications and to become emulsified with some of the secretions. This process naturally interferes with the sharp outlines of the roentgenogram.

SUMMARY

A survey of the literature and a review of our own experience leads us to the following observations:

(1) Iodized oil is an ideal fluid for the demonstration of the lower respiratory tract. A roentgen opaque gas would undoubtedly be preferable and is said to have been used, but is not commercially available.

(2) The introduction of this oil demands a careful technique and the services and cooperation of an experienced laryngologist,

(3) Bronchiectatic cavities, whether simply cylindrical or saccular dilatations simulating cavity formation, are easily shown.

(4) Abscess cavities are not easy of demonstration by this method, as the swelling of the mucosa of the bronchus leading to the abscess cavity will prevent the oil from entering the lesion.

(5) Roentgenoscopic examination gives more precise results.

(6) Interpretation of appearances which are not pronounced should be made with caution, as considerable experience is necessary for accuracy in borderline cases. It must be remembered that in films made with a comparatively slight target film distance the bronchi near the roentgen tube will appear larger than in reality; also, that the filling of emphysematous areas may lead to false conclusions as to small cavity formations.

(7) The injection of cavities which are easily recognized in the routine roentgenogram, such as are found in tuberculosis, is not to be considered as a routine procedure.

(8) From an anatomic standpoint, the visualization of the bronchial tree is an important aid in teaching practical anatomy.

(9) As in all other branches of roentgen-ray interpretation, one should become very familiar with the appearance of normal bronchi before passing final judgment on the abnormal.

THE VALUE AND SAFETY OF A SIMPLIFIED METHOD OF PNEUMOENCEPHALOMYELOGRAPHY*

A PRELIMINARY REPORT ON THE USE OF A SPECIAL APPARATUS IN 40 CASES

BY FRANK LIBERSON, M.D.

Roentgenologist, U.S.P.H.S. Hospital, No. 21, Stapleton; U.S.P.H.S. Hospital, No. 70

NEW YORK CITY

THE demand for roentgenographic aid in medicine and surgery is dependent upon and is proportional to the efficiency and the safety of the methods employed. That there is a demand for roentgenographic aid in the average neurological clinic, especially in localizing brain and cord lesions is implied from the statistics gathered even from the better class of clinics.

At Eiselberg's clinic (quoted by W. Denk[1]) of 318 cases operated on for brain tumor, 40 per cent were not localized by clinical methods. Bailey[2] reported a series of 118 consecutive cases operated on for brain tumor, 46.6 per cent of which were not localized or were mistakenly diagnosed. Dandy[3] in a recent report states that only 50 per cent of brain tumors are localized by clinical means.

The ordinary method of skull roentgenography is of limited value because it is applicable to a class of tumors that originate in the meninges or skull or very close to these structures. This class of tumors constitutes approximately 16 per cent of all intracranial tumors, of which only one-half[4] give demonstrable roentgenographic criteria at the time when they are still operable.

The majority of tumors, as can be seen from a collected series made by Collier and Tooth, together with Stern,[5] begin at some distance from the periphery of the brain and consequently escape detection by unaided roentgenography until a late stage, when the diagnosis has become of academic value only.

In order to give roentgenographic aid in localization of centrally situated tumors of the brain, some means has to be employed to substitute a denser or a rarer medium for the ventricular subarachnoid fluid.

Dandy of Baltimore experimented with different mediums and finally adopted air as the simplest and safest medium. The Dandy method was adopted both in this country and abroad, and according to the reports of careful workers, [3, 6, 7, 8, 9, 10] the percentages of correct diagnoses by the combined air substitution and roentgenography are increased above those obtained from the purely clinical method by 10 to 35 per cent.

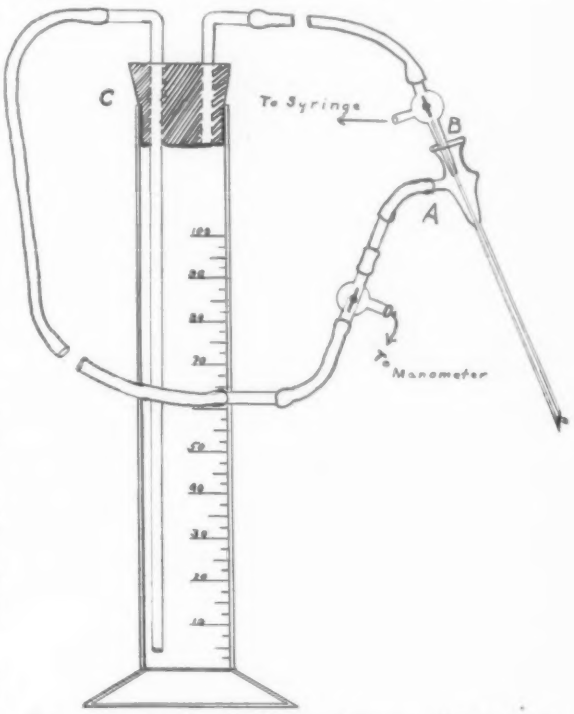


FIG. 1. A drawing of the simultaneous displacement apparatus. The monometer and starting syringe are not shown. (Full description of apparatus in *Arch. Neurol. & Psychiat.*, 1924, xii, 300–304.)

The original method of Dandy consists in trephining over the anterior, posterior

* Approved for publication by the Surgeon General U. S. P. H. S.; Read at the Twenty-sixth Annual Meeting, AMERICAN ROENTGEN RAY SOCIETY, Washington, D. C., Sept. 22–25, 1925.

or inferior horn of the ventricle, on one or both sides, removing 5 to 10 c.c. of cerebrospinal fluid and replacing this by an almost equal quantity of air. This is repeated until the quantity of fluid withdrawn and air replaced ranges between 25 to 100 c.c. or more. This procedure is of course a major operation.

Another method was later devised by Dandy, by Bingel[11] and by Wideröe[12] independently. It consists of a lumbar puncture, withdrawing 5 to 10 c.c. of fluid at a time and replacing an almost equivalent quantity of air; this is repeated until the total quantity ranges between 70 to 150 c.c. or more.[13] This, of course, is a minor procedure, but the patient suffers more than from the trephine method. There is severe headache, nausea and vomiting reported by all[14] workers in this field; some report an unexplained rise of temperature and at times collapse.

The direct, or Dandy's, method of air insufflation of the ventricles appears to be the more accurate method of demonstrating the location of a tumor which is situated nearer to the center of the brain than to the periphery, and is the only air substitution method of localizing a tumor in the cerebrum in cases where there is obstruction to free communication between the ventricular and subarachnoid system or between the spinal and cerebral subarachnoid spaces.

On the other hand, in cases where the tumor is situated nearer the periphery, the indirect, (that is, the spinal method) is of greater value, since that enables the visualization of the subarachnoid spaces. The diminution or absence of these spaces over an area (barring that due to position) points to pathology. As to the safety of each procedure, the figures compiled from six different clinics[6, 7, 15, 16, 17] show a mortality of 9.25 per cent in the direct ventricular route, but I have thus far been unable to find any authentic report as to mortality from the endolumbar route. Sharp reports 2 deaths in 65 meningitis

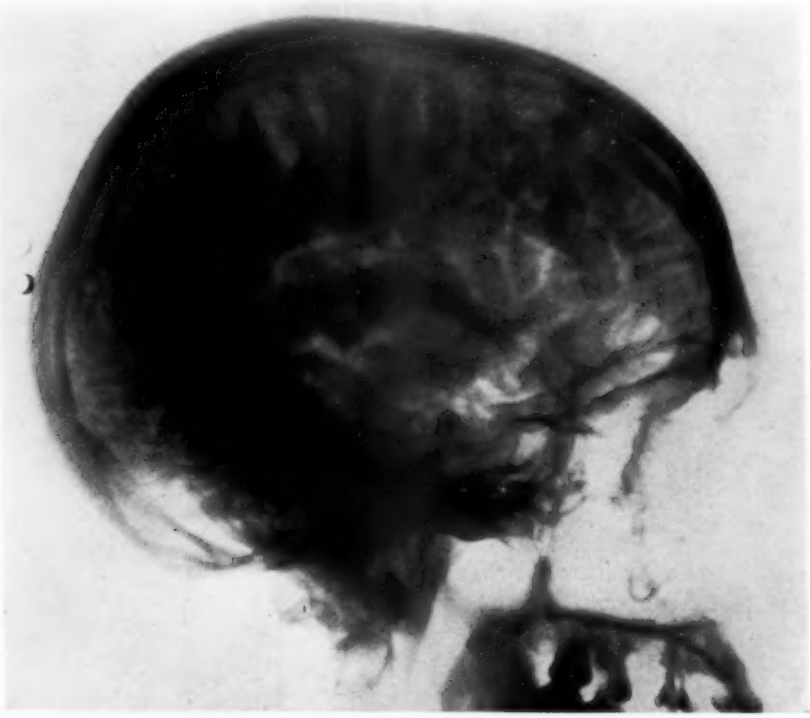


FIG. 2. Shows moderate ventricular distention, and moderate general widening of the subarachnoid spaces in a patient thirty-two years of age. Clinical diagnosis: Paresis. Blood pressure 120/70. The roentgenogram was taken in the horizontal position. Roentgen diagnosis: Paresis.

cases, but both were moribund. Bingel reports 300 cases with no authentic mortality. However, most workers in the field[19, 20] warn against the use of the endolumbar route, especially in posterior fossae tumors on account of possible herniation of the medulla. This might be explaineh by the intermittent alteration of the intracranial and intraspinal pressures during the procedure in which the fluid aspiration and injection of air are accomplished alternately.

one reaching to the bottom of the cylinder (C), the other the top. The one from the bottom ends outside the cylinder in an ordinary Quincke type of lumbar puncture needle (A) with a side arm, and the other tube ends in a very fine cannula (B) inserted into the puncture needle.

TECHNIQUE

(*A*) *Mechanics of Apparatus*[21]. In order that we may fully appreciate the value of this apparatus in avoiding variation of

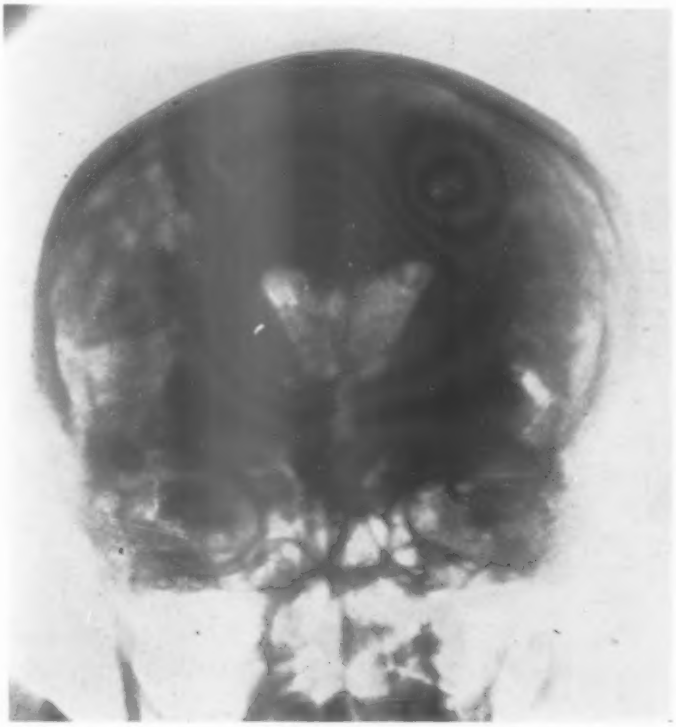


FIG. 3. A posteroanterior view of the same case as Figure 2.

In order to overcome the latter difficulty, the author constructed an apparatus for simultaneous displacement of liquids by gases. The principle of the apparatus is based on the fact that if a gas is confined at a relatively lower level than a liquid and the containers of the two fluids are connected by two tubes, the heavier fluid will descend, and simultaneously the lighter fluid will ascend.

The apparatus (Fig. 1) for the cerebrospinal fluid displacement consists of a stoppered cylinder with two connecting tubes,

intraspinal and intracranial pressures during the displacement of the fluid, I have constructed a schematic spinal cord within a rigid glass tube. Within this spinal cord there is a tambour with an indicator. It will be seen that if the ordinary method of endolumbar insufflation is used, the pressure of the tambour diminishes during the aspiration period and increases during the injection. This see-saw movement of pressure is present in the delicate spinal coverings throughout the period of fluid displacement. Similar changes also occur

in the cerebral coverings. On the other hand, by the use of the simultaneous apparatus, no such see-saw variation in the pressure occurs, but there is a very slow and gradual decline of the pressure equalizing the original pressure with the pressure in the cylinder.

It is best to use a cylinder that will contain approximately the quantity of fluid expected, since the *final* pressure in the subarachnoid spaces equals the total pressure of the cerebrospinal fluid divided by the sum of the fluid and the capacity of the cylinder, due allowance being made for the difference between the temperature in the cylinder and the body temperature. In a normal case, with the use of a 100 c.c. cylinder, the final pressure is two-thirds that of the original.

$$\frac{\text{Total pressure of cerebrospinal fluid}}{\text{Quantity of F. + capacity of cyl.}} = \text{Final pressure}$$

(*B*) *Procedure.* Preparation is the same as for ordinary lumbar puncture. In addition, food is avoided for at least six hours preceding. The sterilized and *drained* apparatus is disconnected at the lumbar puncture needle and the stylet introduced into the needle. The puncture is done in the median line, usually in the fourth interspace; the direction of the needle is upward about 30° from the horizontal, the patient upright or slightly inclined. As soon as the subarachnoid space is reached, the needle is rotated with its arm upward; the cylinder is connected to the needle; the stylet is withdrawn; the smaller cannula is inserted into the puncture needle and the lumbar puncture needle is then rotated to the original position; that is, arm downward. The cylinder is then held at the same level as the puncture and a pressure reading is made. Following that, the cylinder is lowered and two minutes allowed for the start of the exchange of the fluid with the

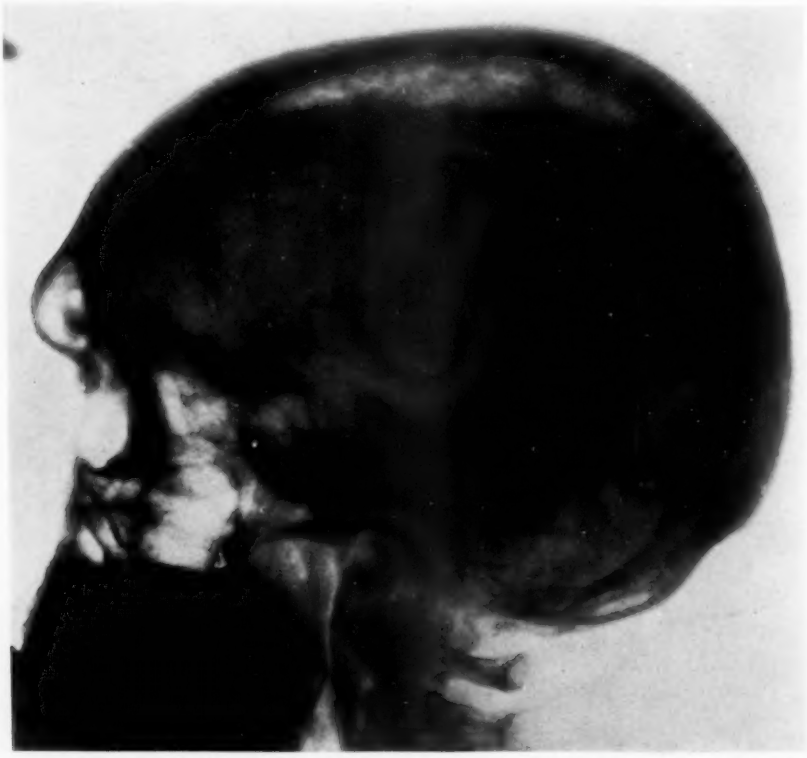


FIG. 4. Shows a coalescence of the subarachnoid spaces at the dome in a patient fifty-two years of age. Clinical diagnosis: Tabes. Blood pressure 120/70. Note the horizontal level of the air and fluid at the dome. Roentgen diagnosis: Paresis.

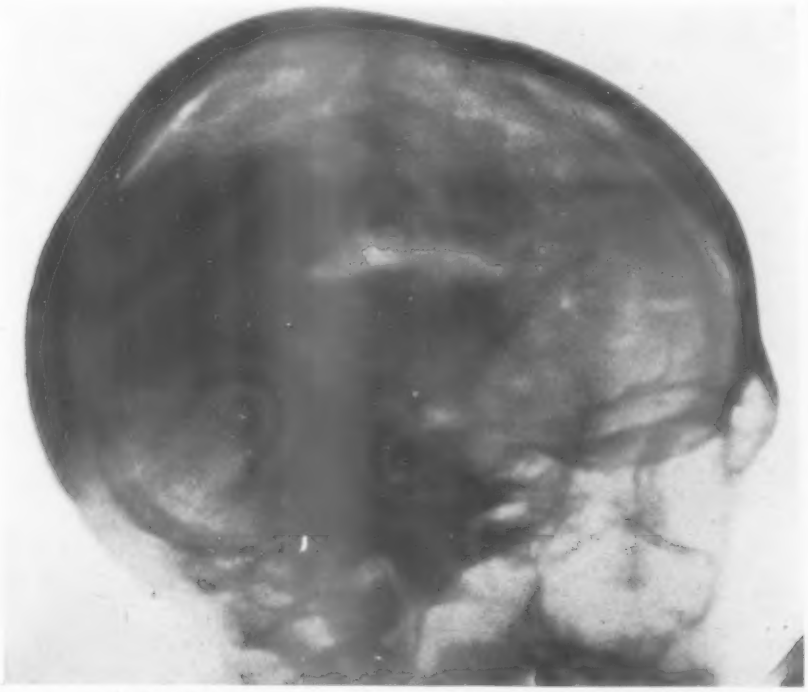


FIG. 5. Shows a more marked coalescence of the subarachnoid spaces at the dome with greater retraction of the brain, in a patient thirty-two years of age. Clinical diagnosis: Paresis. Blood pressure 120/80. Note the horizontal air and fluid levels at the dome and lateral ventricle. Roentgen diagnosis: Paresis.

FIG. 6. Shows a still more marked coalescence of the subarachnoid spaces at the dome in a patient, aged fifty-four. Clinical diagnosis: Taboparesis. Blood pressure 145/90. Note the two air and fluid levels corresponding to each hemisphere; in this patient 250 c.c. of fluid was displaced by air before the ventricles began to outline.

incoming air from the cylinder. This is accomplished by lowering the cylinder to a level where quantity of fluid reaching the cylinder is not more than 5 c.c. per minute. Ordinarily, 12 inches below the level of the puncture in the upright position is sufficient. In case the fluid is very viscid, as it is in long standing xanthochromia, the cylinder is lowered its full length of tubing, about 40 inches. During the period of exchange the fluid raised and the patient's head gently lowered. Fluid will now re-enter the spinal canal and air will ascend to the raised cylinder. The withdrawing of the needle is done in an order, the reverse of that when introduced.

ROENTGENOGRAPHIC TECHNIQUE

(*A*) *In Head Cases.* The patient is roentgenographed in the last position, preferably

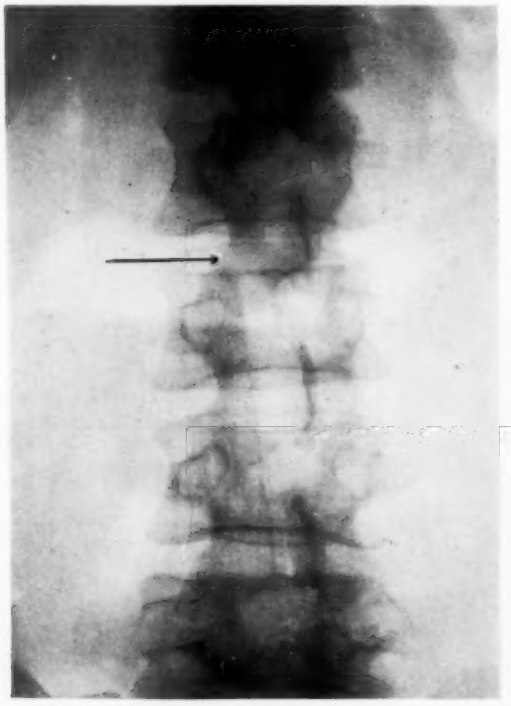


FIG. 7. Shows an obstructive lesion of the cauda equina. Its lowest level is at the upper border of the third lumbar vertebra. Note the ventricle air column in the spinal canal in the region of the fourth and third lumbar vertebrae as distinct from the horizontal air shadow due to gas in the colon. Although 22 c.c. of fluid was displaced by air, operation revealed a lower border of the tumor corresponding to the arrow on the print.

FIG. 8. Shows an obstructive cord lesion situated in the region of the ninth dorsal vertebra. Note the two air lines discontinued in the region of the arrows. Tumor was found intradurally, anteriorly and slightly more to one side than the other.

operator has nothing else to do but take pressure readings. As soon as air is seen in the fluid cannula, the patient's head is gently turned to the opposite side, permitting the opposite ventricle to drain. The procedure is usually complete when the fluid cannula shows air continuously. If the procedure suggests normal findings and the immediate spinal fluid and roentgen examination substantiates it, the process may be reversed: The cylinder holding the

stereoscopically. He is then permitted to flex his head to the opposite side and after two minutes, the opposite lateral stereo is taken using screens, bedside unit with 10 ma., 3 seconds is sufficient. The patient is now placed in the reclining position and a fronto-occipito stereo is taken. Next a single plate is taken with the patient in the prone position, the head being at an angle of 30° from the horizontal. On the following day the patient is taken to the roentgen laboratory and the exposures repeated in different positions, but not stereoscopically. We have found that by this arrangement

we get the subarachnoid spaces outlined immediately after the replacement, while the ventricles outline best on the films taken the following morning. Sometimes we get a ventricular outline on the following morning where none was apparent after the replacement. In only two cases did we have to repeat the method before we filled the ventricles and in only two others did we fail even after repetition. That was on account of obstruction to the foramina of Magendie and Luschka.

(*B*) *In Spinal Cases.* We gather from the literature that there is considerable difficulty in getting good roentgenograms. Jacobaeus[22] states that he did make successful roentgenograms but could not reproduce them in print. Bingel mentioned similar experiences, while Dandy reproduced in print all the tumors of the cord up to the level of the trachea, but he claims that on account of the trachea, the air line of the subarachnoid space in the level of the trachea is not easily discernible. To overcome some of these difficulties, we have adopted the following technique:

The patient is placed in the upright position against a vertically suspended Bucky-Potter diaphragm. Two lead arrows are placed horizontally on the back, the tip of one, one inch to the left of the spinous process of the body indicated by the neurological findings; the tip of the other, one inch to the right of the spinous process of the body indicated by the amount of spinal fluid displaced. These two arrows not only indicate the range of error of the clinical and fluid quantity levels, but also serve as a basis for exact localization of the roentgen-ray level with the external topography. For the guidance of the surgeon, the levels of the two lead arrows are marked by silver nitrate stuck on the skin.

FIG. 9. Shows an obstructive lesion of the eighth dorsal vertebra, with widening of the subarachnoid space, distal to the obstruction. Note the widened air shadow on one side just below the obstruction. This was due to a metastatic lesion in the laminae, causing the obstruction.

FIG. 10. Shows obstruction of an extradural type. Note the two air lines on each side of the cord, curving to one side, in the region of the ninth dorsal vertebra, until they are entirely obliterated in the region of the eighth dorsal vertebra.

In the cervical region the anteroposterior positions are not satisfactory for visualization of the subarachnoid space, on account of the trachea. We therefore make use of the oblique positions and complete lateral; in the latter case no Bucky-Potter diaphragm is used.

DIAGNOSTIC VALUE

In localization of brain tumor, this method offers the same general aid as the ordinary endolumbar route, with one apparent advantage of safety. It is therefore applicable to suspected or even normal cases. It may also be used in conditions other than brain or cord tumors, such as adhesions and retractions. Above all, it may help to *exclude organic brain and cord conditions*. Our series of 40 cases consisted of 14 normal cases, 2 cases of brain tumors, 10 cases of syphilis of cerebrospinal system, including paresis, 9 cord cases of which 6 were tumors, one adhesions and two negatives, one litigation spine, two encephalomyelitis, one epileptic (?). The normal cases showed a symmetrical ventricular outline. The septum was sometimes deviated to the right or to the left at its inferior half, probably due to position during the roentgen-ray exposure. The subarachnoid spaces outlined uniformly at the dome, 2 to 3 mm. wide. In other cases where the subarachnoid spaces were unusually large, with or without ventricular distention, especially in young people, we have found our patients to suffer from paresis; so that, at present, when we find a retraction of the brain to a stage where the subarachnoid spaces coalesce and give a horizontal fluid air level on the film, in the upright position, our roentgen diagnosis is paresis (Figs. 2–6).

FIG. 11. Shows no evidence of obstruction in the suspected region. The two air lines are not as distinctly marked on account of incomplete drainage. The air lines were observed the entire length of the cord.

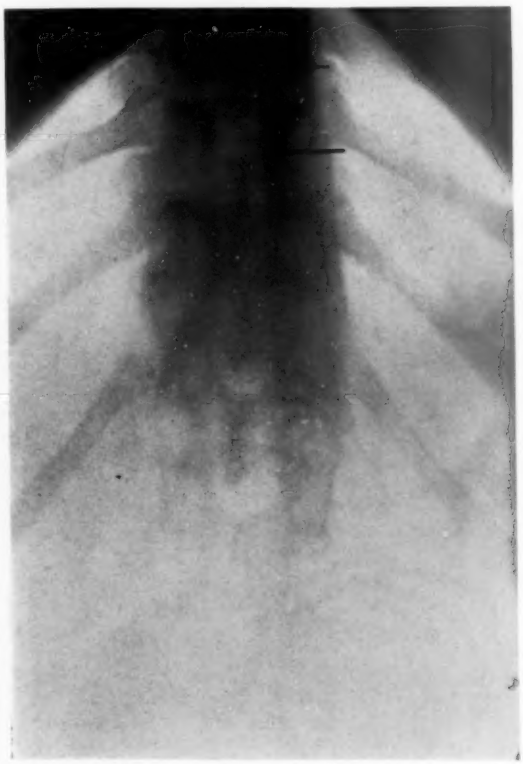


FIG. 12. Shows an obstructive lesion in the region of the tenth and ninth dorsal vertebrae, of the tapering type. This obstruction was found by operation to be the result of adhesions. Patient made an uneventful recovery. Note the gradual thinning of the two air lines and their imperceptible disappearance.

In the 9 spinal cord cases examined by this method, the roentgen ray located the site of obstruction in 7 cases (Figs. 7–10), the remaining 2 showed no obstruction (Fig. 11). In one of these 2 cases two

operations were done because of strongly suggestive clinical findings, but no obstruction was found. The patient recovered completely. In the second case the suggestive clinical signs were due to syphilitic myelitis, non-obstructive, as shown by the post-mortem findings. In one of the 7 obstructive cases, the clinical diagnosis was syphilis; roentgen examination showed obstruction of tapering type (Fig. 12); operation revealed adhesions. The patient made complete recovery after separation of adhesions. We have learned to put great reliance in this method of localizing cord tumors and Dr. Joseph J. King has made it a routine before operation on all suspected obstructive cord lesions.

FIG. 13. Shows marked enlargement of anterior horn of left lateral ventricle. The right lateral ventricle is also slightly enlarged, suggestive of an obstructive lesion of left lateral ventricle of cystic nature.

AFTER EFFECTS: IMMEDIATE

In our series of 40 cases (4 cord cases through the courtesy of Dr. J. J. King at Bellevue and Misericordia Hospitals, 5 office cases, the others from the services of Marine Hospitals, Stapleton and New York), the after effects were not so pronounced as reported by the use of the ordinary endolumbar route.

Sense of Cranial Succussion. On change of position, especially on walking up or down stairs, the patient experiences a peculiar splashing, rushing sound, which lasts while the ventricles are partly filled. It is the least troublesome.

Headache. During the procedure, especially during change of position or posture necessitated while making roentgen exposures, headache is complained of in the majority of cases. Those having received preliminary morphine, and those not having received it, reacted about alike. Morphine given after the procedure for the existing headache is helpful.

Nausea and Vomiting. Nausea is at times induced by quick motion of head as long as ventricles are partly filled. Only 5 patients vomited during the procedure but all of these had food not more than two hours before the procedure, or took food shortly after the procedure.

Temperature. A rise of 1°C. was observed in 5 cases. All of these had salvarsan administered intravenously six hours before the procedure. In 2 of these cases the rise of temperature was present even before the procedure; the temperature of the others was not taken.

Collapse. This occurred in 2 cases not unlike fainting—slowing of pulse, lowering of blood pressure, pallor and cold perspiration; both of these patients were of highly apprehensive, neurotic type:

Pain. Occasionally on introducing the needle, a sharp pain was complained of in one or both legs—probably due to needle touching a nerve root. In one case, a tabetic, lancinating pains were experienced in both legs, gradually subsiding within a week. In 7 obstructive cord cases, 4 experienced girdle pains, referred to the zone of hyperasthesia.

AFTER EFFECTS: REMOTE

So far no bad remote effects have been noticed; on the contrary, in some cases besides an established diagnosis, definite beneficial effects were observed. These effects, however, were present in cases where multiple drainage replacements were used. In one case, with a roentgen diagnosis of brain cyst (Fig. 13) and clinical evidence of hemiplegia, symptoms disappeared and have not recurred up to the present—a period of two years. Of 8 paretics, 5 improved to the extent of returning to their duties as seamen, following our routine of six drainages and replacements plus intravenous medication. It is unlikely that all these would have been ordinary remissions.

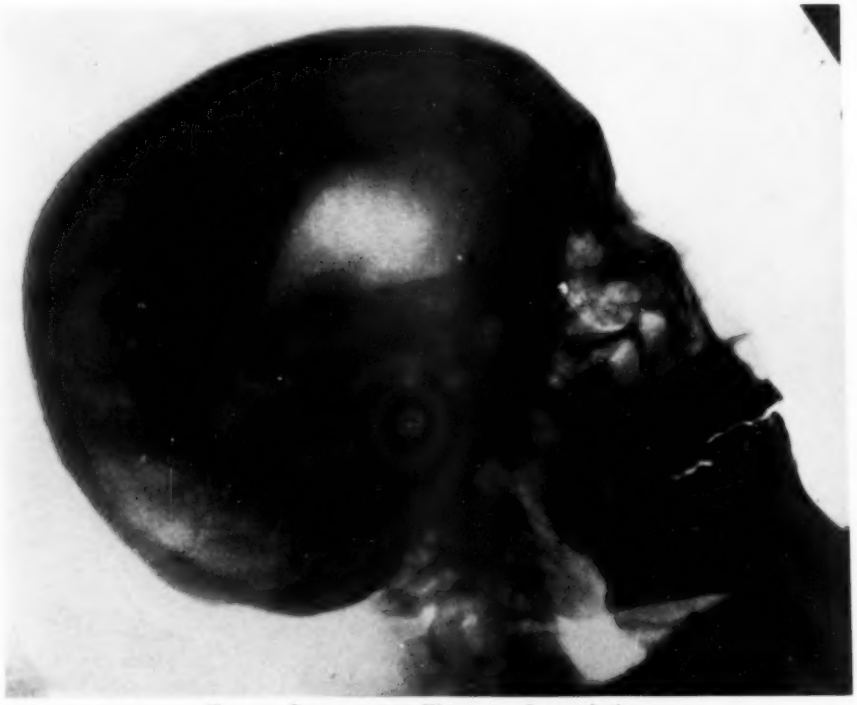


FIG. 14. Same case as Figure 13. Lateral view.

SUMMARY AND CONCLUSIONS

(1) Clinical methods without roentgenographic aid are insufficient for localization of early brain and cord lesions.

(2) The unaided roentgen ray has limited applicability.

(3) Roentgenography when aided by air insufflation of the ventricular subarachnoid

system has its diagnostic value enhanced by about 35 per cent.

(4) Methods of air insufflation are described and relative values compared.

(5) A method of simultaneous displacement of the cerebrospinal fluid by air is described with illustration of mechanism and technique, and its use is emphasized in cord cases, and cases other than brain tumors.

(6) The safety of the method is compared with other methods, by citing the immediate and remote after effects as observed in 40 cases.

(7) It is hoped that the application of this method will be employed, with the aim of establishing criteria for the normal appearance of the ventricular subarachnoid systems.

(8) Because of its applicability and relative safety, it is hoped that it may serve to broaden the usefulness of the roentgen ray in the diagnosis of cerebrospinal affections other than brain or cord tumors.

REFERENCES

1. Denk, W. Die Bedeutung der Ventrikulographie für die Hirndiagnostik. *Arch. f. klin. Chir.*, 1922, cxxi, 168–175.
2. Bailey, P. Clinical classification of intracranial tumors. *Arch. Neurol. & Psychiat.*, 1921, v, 418.
3. Dandy, W. E. Diagnosis and localization of spinal cord tumors. *Ann. Surg.*, January, 1925, lxxxi, 223–254; Ventriculography following injection of air into the cerebral ventricles. Am. J. Roentgenol., 1919, vi, 26; Roentgenography of the brain after the injection of air into the spinal cord. *Ann. Surg.*, 1919, lxx, 397–403; Cause of so-called idiopathic hydrocephalus. *Johns Hopkins Bull.*, 1921, xxxii, 67.
4. Sosman, M. C., and Putnam, T. J. Roentgenological aspects of brain tumors; meningiomas. Am. J. Roentgenol. & Rad. Therapy, January, 1925, xiii, 1–10.
5. Ewing, James. Neoplastic Diseases. W. B. Saunders, Philadelphia, 1919, p. 380.
6. Grant, F. C. Ventriculography. Clinical experience based on a study of 40 cases. *Arch. Neurol. & Psychiat.*, 1923, x, 154–166.
7. Jüngling, Otto. Fortschritte auf dem Gebiet der Lokalisation von Hirngeschwülsten durch Ventriculographie nach Dandy. *Arch. f. klin. Chir.*, 1924, cxxxiii, 449–464.
8. Schüller, A. Zur Röntgendiagnose der intrakraniellen Affektionen mit Hilfe des Dandyschen Verfahrens. *Wien. klin. Wchnschr.*, 1922, xxxv, 709–711.
9. Gabriel, Uber Enzephalographie. *Fortschr. a. d. Geb. d. Röntgenstrahlen, (Kongressheft II)*, 1923, xxx, 65–66.
10. Weigeldt, W. Die Bedeutung der Lufteinblasung für Hirn- und Rückenmarksdiagnostik. *Deutsche Ztschr. f. Nervenheilk.*, 1923, lxxvii, 165–173; *Fortschr. a. d. Geb. d. Röntgenstrahlen, (Kongressheft II)*, 1923, xxx, 63–65.
11. Bingel, A. Die Röntgenographische Darstellung des Gehirns. *Klin. Wchnschr., Berl.*, 1922, i, 2191–2197.
12. Wideröe, Sofus. Ueber die diagnostische Bedeutung der intraspinalen Luftinjektionen bei Rückenmarksleiden, besonders bei Geschwülsten. *Zentralbl. f. Chir.*, 1921, xlviii, 394–397.
13. Wyatt, O. S. Cerebral pneumography and aid in early diagnosis of hydrocephalus. *Journal-Lancet*, 1923, xliii, 625–628.
14. Cestan and Riser. La ventriculographie cérébrale par la pneumorachie. *Bull. et mém. Soc. méd. d. hôp. de Par.*, 1924, 3.s., xlviii, 953–961.
15. McConnell, A. A. Ventriculography as an aid in the localization of intracranial tumours. *Brit. M. J., Lond.*, 1923, ii, 796–798.
    Jefferson, Geoffrey. Ventriculography as an aid in the localization of intracranial tumours. *Brit. M. J., Lond.*, 1923, ii, 799–801.
16. Adson, A. W., Ott, W. O., and Crawford, A. S. A study of ventriculography. *Radiology*, 1924, ii, 65–73.
17. Bassoe, P., and Davis, Carl B. Two cases of brain tumor with ventriculography. *Arch. Neurol. & Psychiat.*, 1923, ix, 178–183.
18. Sharp, E. A. Artificial pneumorachie in the treatment of acute infections of the meninges. *Arch. Neurol. & Psychiat.*, 1921, vi, 669.
19. Martin, C. L., and Uhler, Claude. Roentgenography of intracranial passages following spinal air injection. Am. J. Roentgenol. & Rad. Therapy, 1922, ix, 543–549.
20. Alwens, W., and Hirsch, S. The diagnostic and therapeutic importance of endolumbar insufflation of air (encephalography). *München. med. Wchnschr.*, 1923, lxx, 41–44.
21. Liberson, F. Apparatus for simultaneous displacement. *Arch. Neurol. & Psychiat.*, 1924, xii, 300–304.
22. Jacobaeus, H. C. On insufflation of air into the spinal canal for diagnostic purposes in cases of tumors of the spinal canal. *Acta med. Scan.*, 1921, lv, 555–564.

TRAUMATIC COXA VARA

A CASE REPORT

BY WILLIAM COLIN, M.D.

Roentgenologist, Harlem Hospital

NEW YORK CITY

A young man, aged seventeen, was brought to Harlem Hospital after an accident while playing baseball. He stated that while running he fell on his right side and was unable to rise. Figure 1 was taken upon the patient's admission to the hospital, and an erroneous diagnosis of fracture through the neck of the right femur with shortening of

FIG. 1.

FIG. 2.

the neck was made from the roentgenogram. Under anesthesia the leg was rotated and abducted and put in a plaster cast. Figure 2 shows the femur in the cast with a full outline of the neck.

This case illustrates the importance of considering the possibility of epiphyseal displacement in the diagnosis of injuries about the hip joint in adolescents.

THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY

Editor: ARTHUR C. CHRISTIE, M.D.

Editorial Board: JAMES T. CASE, M.D. H. K. PANCOAST, M.D. WILLIAM DUANE, PH.D.

Advisory Board for Pathology: JAMES EWING, M.D. EUGENE OPIE, M.D. A. S. WARTHIN, M.D.

Collaborating Editors: The Officers and Committee Members of the Societies of which this JOURNAL is the official organ, whose names appear on this page, are considered collaborating editors of this JOURNAL. *Foreign Collaborators:* A. BÉCLÈRE, M.D., PARIS. GÖSTA FORSSELL, M.D., STOCKHOLM. G. F. HAENISCH, M.D., HAMBURG. ROBERT KNOX, M.D., LONDON. R. LEDOUX-LEBARD, M.D., PARIS.

Publishers: PAUL B. HOEBER, INC., NEW YORK

Issued Monthly. Subscription $10.00 per year, $11.00 in Canada and $12.00 in foreign countries. Advertising rates submitted on application. Editorial office, 1909 Massachusetts Ave., N.W., Washington, D.C. Office of publication, 67-69 East 59th Street, New York

Information of interest to all readers will be found on page i. Lists of officers of The American Roentgen Ray Society and The American Radium Society will be found below

Officers and Standing Committees

THE AMERICAN ROENTGEN RAY SOCIETY

President: THOMAS A. GROOVER, 1909 Massachusetts Ave., Washington, D. C.; *President-elect:* RUSSELL D. CARMAN, Mayo Clinic, Rochester, Minn.; *First Vice-President:* P. F. BUTLER, Boston, Mass.; *Second Vice-President:* CHARLES RICHARDS, San Jose, Calif.; *Secretary:* CHARLES L. MARTIN, 701 Medical Arts Bldg., Dallas, Texas; *Treasurer:* WILLIAM A. EVANS, 10 Peterboro St., Detroit, Mich.; *Librarian and Historian:* H. W. DACHTLER, 224 Michigan St., Toledo, Ohio.

Executive Council: H. M. IMBODEN, Chairman, 480 Park Ave., New York City, E. H. SKINNER, Kansas City, Mo., WILLIAM DOUGHTY, Cincinnati, O., THOMAS A. GROOVER, Washington, D. C., RUSSELL D. CARMAN, Rochester, Minn., A. C. CHRISTIE, Washington, D. C., CHARLES L. MARTIN, Dallas, Texas, WILLIAM A. EVANS, Detroit, Mich., RALPH LEONARD, Boston, Mass., RAYMOND C. BEELER, Indianapolis, Ind., ROY A. PAYNE, Portland, Oregon.

Committee on Laws and Public Policy: B. R. KIRKLIN, Chairman, Muncie, Ind., FRED M. HODGES, Richmond, Va., WILLIAM E. CHAMBERLAIN, San Francisco, Calif.

Safety Committee: H. K. PANCOAST, Chairman, University Hospital, Philadelphia, Penna., P. M. HICKEY, Ann Arbor, Mich., J. T. MURPHY, Toledo, O., W. D. COOLIDGE, Schenectady, N. Y., WM. DUANE, Boston, Mass., B. H. NICHOLS, Cleveland, O.

Committee on Scientific Exhibit: LAWRENCE REYNOLDS, Chairman, 10 Peterboro St., Detroit, Mich., B. H. NICHOLS, Cleveland, O., M. C. SOSMAN, Boston, Mass.

Publication Committee: H. M. IMBODEN, Chairman, New York City, WILLIAM A. EVANS, Detroit, Mich., E. H. SKINNER, Kansas City, Mo.

Member, National Research Council: P. M. HICKEY, Ann Arbor, Mich.

Member, American Board of Registry of Radiological Technicians: E. S. BLAINE, Chicago, Ill.

Editor: A. C. CHRISTIE, 1909 Massachusetts Ave., N. W., Washington, D. C.

Editorial Board: JAMES T. CASE, H. K. PANCOAST, WM. DUANE.

Advisory Board for Pathology: JAMES EWING, EUGENE OPIE, ALDRED S. WARTHIN.

Publishers: PAUL B. HOEBER, Inc., 67–69 E. 59th St., New York City.

Twenty-seventh Annual Meeting: Book-Cadillac Hotel, Detroit, Michigan, May 17–21, 1926.

THE AMERICAN RADIUM SOCIETY

President: DOUGLAS QUICK, 350 Park Ave., New York City; *President-Elect:* ALBERT SOILAND, Los Angeles; *First Vice-President:* B. F. SCHREINER, Buffalo; *Second Vice-President:* G. W. GRIER, Pittsburgh; *Secretary:* E. C. ERNST, St. Louis; *Treasurer:* S. M. WITHERS, Denver.

Executive Committee: R. E. LOUCKS, Chairman, Detroit, JAMES T. CASE, Battle Creek, Mich., W. S. NEWCOMET, Philadelphia.

Program Committee: HENRY SCHMITZ, Chairman, Chicago, LEDA J. STACY, Rochester, Minn., B. F. SCHREINER, Buffalo, N. Y.

Publication Committee: H. K. PANCOAST, Chairman, Philadelphia, G. FAILLA, New York City, E. C. ERNST, St. Louis.

Standardization Committee: G. FAILLA, Chairman, New York City, WILHELM STENSTROM, Buffalo, N. Y., A. WEATHERWAX, Philadelphia.

Eleventh Annual Meeting: Baker Hotel, Dallas, Texas, April 19 and 20, 1926.

Committee on Arrangements: CHARLES L. MARTIN, Dallas, Texas, JOHN W. CATHCART, El Paso, Texas, OSCAR L. NORSWORTHY, Houston, Texas.

EDITORIALS

ULTRAVIOLET RADIATION

ULTRAVIOLET therapy may well be referred to as at once the oldest and the newest method of combatting certain diseases—oldest, because the human body has been subjected to the influence of this invisible radiant accompaniment of sunlight ever since man appeared upon the earth, newest because only recently, since the coming of cheaper and better fused quartz, has it been easily possible to generate artificially this form of radiant energy. The ultraviolet generator is no longer an elaborate and expensive equipment, available only in certain centers, but, on the contrary, is now comparatively simple and can be installed wherever electric current is available.

Among the ancients, notably the Egyptians, the Persians, the Hindus, and the Aztecs, sunlight was held in very high repute as a means of combatting disease and of promoting general bodily vigor. But from the advent of the Dark Ages down to comparatively recent years, heliotherapy, which in the main is ultraviolet therapy, has not been duly appreciated.

Roentgenologists have possibly been somewhat retarded in their recognition of the therapeutic value of ultraviolet rays by the known lack of any appreciable penetrating powers of this form of radiation. Trained to think in terms of short wave lengths, and greater and greater penetration, and *nearly* believing that greater penetration means better therapeutic effect, it comes as a reversal of ideas to conceive that therapeutic properties may reside in a form of radiation whose waves are so long and whose penetration is so slight as is the case with the ultraviolet ray.

Roentgen rays and radium rays are radiant energy; and ultraviolet is simply radiant energy of a different wave length. Ultraviolet is a part of the whole spectrum of radiant energy. It is that part of the spectrum embracing wave lengths from about 2000 to about 4000 Ångstrom units, the part of the spectrum we are accustomed to say is situated just "beyond" the violet in the spectrum of ordinary light. The spectrum of white light embraces a somewhat greater range of wave length than does the spectrum of ultraviolet, but is of the same order, and constitutes an extremely small part of the whole spectrum of radiant energy. The physicist tells us that if the spectrum of light were projected on a scale of one foot, and the whole spectrum of radiant energy projected in the same proportion, its length would stretch away to more than a million miles.

All of the different kinds of rays making up the vast spectrum of radiant energy are propagated in virtually the same way and at about the same rate. They are possessed, however, of vastly different properties. The only demonstrable physical difference is that of wave lengths, and accompanying rate of oscillation. Hence it is likely true that the properties of any type of radiant energy are dependent upon its wave length.

Some of these forms of radiation have most marked effect upon the living organism, while others, so far as we yet know, have no effect—witness the effect of roentgen rays and radium rays, and the lack of effect, so far as we know, of radio waves in which we are soaked from night to night. Some of these forms of radiation can be detected by certain of the special senses, others cannot. Radiation of the order of a fraction of an Ångstrom unit, roentgen rays or radium rays, are entirely invisible and make no appeal to any of the special senses. All wave lengths between red and violet stimulate the organ of vision, and, as we say, are visible. Shorter than violet the human eye cannot see, while rays longer than red make no appeal to the eye as an organ of vision. Somewhat longer than the red rays are the rays of radiant heat. The living organism perceives these

rays by stimulation of a special sense for the detection of heat and cold. Beyond this very limited range of wave lengths the living being has no natural means of detecting the presence of radiant energy.

But when radiant energy waves of certain lengths are intercepted by a living being, very marked effects are produced, even though the organism may have no special sense for the detection of such energy. Does that part of the spectrum whose rays range from about 2000 to about 4000 A. in length come under this classification? In other words, is ultraviolet inert as well as invisible, or has it a very marked effect on living organisms, and if so, what are these effects?

When this invisible form of radiation is intercepted by the uncovered human body, it has upon it a most marked influence. Snow blindness or a severe conjunctivitis from exposure to a powerful electric arc, are examples of its distressing effect. If the unprotected skin be exposed to the output of an ultraviolet generator for a few minutes at a given distance, there will follow, within a few hours, a most pronounced erythema. If the exposure is further prolonged a painful blistering occurs. Ultraviolet radiation, then is not inert.

But apart from these easily demonstrable effects, there are certain metabolic influences which are just as definite, though far less spectacular. These rays seem to perform the function of regulating the amount of certain chemical elements circulating in the blood. These elements so far as now known are iron, calcium, and phosphorus.

The radiations which constitute the *visible* spectrum, in a way not yet entirely understood, are absolutely essential to most plant life, through their influence on the chlorophyll. It is not unlikely that most animal life is just as dependent upon those invisible radiations which fall in the ultraviolet zone. Pointing in this direction is the fact that certain diseases and conditions are known to be caused by an insufficient supply of this form of radiation, and the further fact, that these diseases may be cured by supplying this deficiency.

Along this line much experimental and research work has been done on the condition or disease known as rickets. Following the work of T. A. Palm who, after survey in 1890, called attention to the lack of sunlight as a chief factor in the causation of rickets, sunlight therapy was used beneficially in the treatment of rachitic children. This work in England was confirmed by Rollier of Switzerland, who states that rickets is amenable to sunlight therapy. Later the work of Finsen at Copenhagen demonstrated that the portion of the sunlight spectrum of the greatest therapeutic value lay in the ultraviolet zone. Hess and others have repeatedly shown that ultraviolet rays from artificial sources are of unquestioned value in the prophylaxis and treatment of rickets. Recent workers have demonstrated by total calcium analysis of experimental animals that ultraviolet therapy promotes greater calcium retention, resulting beneficially in skeletal development and to the organism as a whole.

If, then, it has been established that ultraviolet light is both preventive and curative in rickets, a disease characterized by poor skeletal development and a deficiency of calcium in the blood, is it not reasonable to suppose that other diseases accompanied by deficient blood calcium might also be benefited by this form of radiation? A number of such conditions at once suggest themselves. Tuberculosis of the bone must be one of them—or much of the remarkable work of Rollier must still go unexplained. Osteomalacia should be curable by ultraviolet rays. It is. Nearly all chronic suppurative conditions are either improved or cured by ultraviolet rays. When a sufficient amount of long wave ultraviolet rays, either natural or artificial, is advised for all expectant mothers, rachitic children will no longer be born, nor will the old adage "for every child a tooth" have left in it any semblance of truth.

But the effect of ultraviolet rays on blood chemistry does not stop at calcium metabolism. The amount of phosphorus and iron are markedly influenced. Ultraviolet radiation is indicated in practically all cases of simple anemia. So is iron. But iron alone will do practically no good in marked anemia. The blood seems to have lost its ability to take up iron from the alimentary

tract. This ability can be restored by ultraviolet radiation. After five to ten exposures of the greater part of the nude body to an appropriate amount and kind of ultraviolet radiation, color will begin to appear in the cheeks, under the nails, and in the lips. Within a few weeks the patient will cease to be pale and will present a normal blood picture. In the meantime many other symptoms of the anemic patient have subsided as the blood returns to normal. Insomnia, poor digestion, general weakness, depression, and nervousness, are all much less evident.

It has not been proven beyond the question of doubt, but it is believed by many who have made extensive study of this subject that ultraviolet rays have a marked influence on the endocrine gland system. Many observations point in this direction: Puberty is established much earlier in the tropics than in higher latitudes. It is said that Eskimo women do not menstruate during the latter part of the long arctic night. Experimental work on young animals—rats and chickens—brings out the fact that growth and development is nearly twice as rapid among the controls. The usual protracted convalescence from Graves' disease may be very much shortened by a series of ultraviolet treatments. The time-honored expression "a healthy coat of tan" probably deserves its name, and likely gained it, partly through the influence of ultraviolet light on the ductless glands.

So far, mention has been made only of influence on the organism of the longer wave length ultraviolet rays, viz., those lying roughly between 3000 and 4000 A. But there are other wave lengths in the ultraviolet zone much shorter than those mentioned above and whose properties are quite different. Reference is made to wave lengths of about 2000 A. A special type of generator is required for the application of this short wave ultraviolet radiation.

While the properties of short wave ultraviolet rays are such as to render them more useful to the chemist, to the physicist, and also in certain commercial fields, than in medicine, still one of their well-known properties brings them at once into the domain of medicine. These rays are possessed of extremely active bactericidal properties. Bacteria simply cannot live in the presence of short wave ultraviolet rays. Possessed of very slight penetrating power these rays will not, however, kill germs at any considerable depth below the surface. In general, the organisms must be exposed directly to the rays. But even so, there are a number of surface conditions, as well as those in accessible cavities, in which this form of radiation is of very great value.

As an illustration of results that may sometimes be obtained by the use of systemic, or long wave ultraviolet radiation, mention may be made of at least one case of generalized blastomycosis which was cured by this agent alone. The causative fungus in this case was recovered from several skin lesions. The roentgen findings in the chest were very similar in appearance to those of tuberculosis. There could be no possible doubt of the diagnosis. Because this patient's blood picture showed only 3,400,000 red cells, and hemoglobin 65 per cent, ultraviolet radiation was advised; but only with the hope that it would improve the blood picture, and help to further combat the infection. All other treatment was discontinued. After twelve treatments in twenty-four days the blood count showed 4,500,000 red cells, and the patient's general appearance had entirely changed—the chronic abscess had nearly healed, and the cough was much improved. Treatment was continued for about three months, at the end of which time the patient had entirely regained his weight, was symptom-free, and apparently in splendid physical condition. This treatment was given about two years ago. The patient is still in splendid condition and is working every day.

One other case of systemic blastomycosis is said to have been cured by a year's residence at a Florida bathing beach. It was thought at the time that sea bathing accomplished the cure, but in the light of the case just mentioned, restoration to health was in all probability brought about not so much by sea bathing as by *sun* bathing.

W. S. Lawrence.

THE STATUS OF RADIUM THERAPY

At the last annual meeting of the American Radium Society, a statement was made by one of the contributors that a noted London surgeon had been quoted to the effect that the London Cancer Hospital had given up the use of radium because its use had been found to lower the resistance of the human tissue and enhance the growth of cancer. This statement had been freely dispersed through American medical centers and had been accepted by some surgeons as a fact. Investigation of the report at its source proved the quotation to be wholly erroneous, and the fact prevailed that the hospital in question made daily use of radium in all cases of malignancy where this agent was indicated.

One reason for disappointment in the use of radium is the fact that many medical men, whose knowledge of the radium subject is not all that it should be, attempt to perform major work with wholly insufficient amounts of radium. A knowledge of all the factors which enter into the therapeutic use of radium has not yet been attained by anyone, and the element of time must be considered before the science can be successfully stabilized.

Radium as a therapeutic agent has now been before the medical profession for two decades, during which time it has been subjected to innumerable clinical tests. Many have claimed for this agent powers which border on the ridiculous; others again have scoffed and condemned radium radiation in every form. Between these two opposed viewpoints, we must seek the truth. It is quite natural that when a new agent is produced which encroaches upon well tried methods of cure, both skepticism and antagonism ensue, so it is not strange to note that even at the present day, many surgeons show resentment to the introduction of radium where formerly nothing but surgery was indicated. There have now been gathered sufficient clinical data, the reliability of which cannot be successfully controverted by any fair-minded investigator.

In certain clinical conditions, the indiscriminate use of radium may well be condemned. One of the hopeful signs of radium utility is found in the fact that the field for this agent is becoming more centralized and restricted to conditions where its peculiar powers of action are best unfolded. Nevertheless, it has been definitely established that superficial malignancies, cancer of the lip, and early carcinoma of the cervix, respond to radium treatment in a manner which is not approached by any other medical or surgical agent.

It is worthy of note that during the past twelve months, radium has suffered a decline in price and also in popularity. Whether this is due to the diminished advertising by radium producing companies or to the fact that radium is not now purchased so freely by the general practitioner is not easily comprehended. At all events, there has been a marked diminution in the quantity of radium sold to the American medical profession within the time period just stated.

While radium in elemental form, due to its stability, is the back bone of this therapy, nevertheless, the more recent perfection in the intubation of radium emanation has materially extended the scope of the latter modality. Recent experiments with the rare metals such as gold and platinum have developed the use of these agents in the form of containers for radium emanation. The common glass container does not offer sufficient protection against the active local reaction as do the metals just named, hence the importance of this development. Skilled artisans have perfected cylinders of platinum and gold of exceedingly fine caliber into which the emanation is pumped in the same manner as into the glass capillary tubes. Planting these tubes into the tissues gives a therapeutic effect of the radium emanation minus its intense local destructive action. This is a long step forward in the evolution of this type of therapy and bids fair to increase its usefulness.

One of the difficult problems of the emanation form of therapy is in accurately determining the quantum of each emanation tube. Therefore, no one should attempt radium emanation therapy without the assistance of a skilled physicist who can keep the clinician informed at all times as

to the sum total of the radium energy at time of use. The achievements of the radium companies in preparing standardized emanation tubes for shipment to remote parts by air mail has been of signal help to radiologists. Even one separated by long distances from such laboratories may by the aid of the aerial mail, upon telegraphic request, receive such radium implants of standard size and accurately predetermined units of content.

To the American Radium Society great credit is due for its carefully conducted, didactic, scientific and clinical work. The members of this Society have shown the true conservative attitude towards radium. In its ranks are found the foremost scientists of America, the work of whom may be safely followed with the assurance that radium will thus be placed upon its rightful therapeutic level.

Albert Soiland.

Subscribers to THE AMERICAN JOURNAL OF ROENTGENOLOGY AND RADIUM THERAPY *visiting New York City, are invited to make the office of* THE JOURNAL (*69 East 59th Street, New York*) *their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.*

SOCIETY PROCEEDINGS, CORRESPONDENCE AND NEWS ITEMS

Items for this column solicited promptly after the events to which they refer.

MEETINGS OF ROENTGEN SOCIETIES

WE contemplate the publication of a list of roentgen society meetings such as that below, in each issue of the Journal, gradually adding other home and foreign societies as the information reaches us. Secretaries of societies not here listed are requested to send the necessary information to the editor.

AMERICAN ROENTGEN RAY SOCIETY
Secretary, Dr. Charles L. Martin, Dallas, Texas.
Twenty-Seventh annual meeting, Detroit, Mich., May 17–21, 1926.

SECTION ON RADIOLOGY, AMERICAN MEDICAL ASSOCIATION
Secretary, Dr. M. J. Hubeny, 25 E. Washington St., Chicago, Ill.
Annual meeting, Dallas, Texas, April 19–23, 1926.

THE RADIOLOGICAL SOCIETY OF NORTH AMERICA
Secretary, Robert J. May, St. Luke's Hospital, Cleveland, Ohio.
Annual meeting, Milwaukee, Wis., Nov. 29–Dec. 3, 1926.

RADIOLOGICAL SECTION, SOUTHERN MEDICAL ASSOCIATION
Secretary, Dr. Sherwood Moore, St. Louis, Mo.
Annual meeting, Atlanta, Georgia, Nov. 15–18, 1926.

THE CANADIAN RADIOLOGICAL SOCIETY
Secretary, Dr. E. C. Brooks, Montreal.
Annual Meeting Victoria, B. C., during week of June 21–25, 1926.

CENTRAL ILLINOIS RADIOLOGICAL SOCIETY
Secretary, Dr. C. J. McCullough, Decatur, Illinois.
Regular meetings held quarterly.

CHICAGO ROENTGEN SOCIETY
Secretary, Dr. Edward S. Blaine, 5 S. Wabash Ave.
Meets monthly on second Friday from October to May (except during month of December) at Virginia Hotel. Dinner at 6 P.M., scientific session at 8 P.M.

CLEVELAND RADIOLOGICAL SOCIETY
Secretary, Dr. E. P. McNamee.
Meetings are held at 6 o'clock at the University Club, on the fourth Monday evening of each month from September to April, inclusive

DETROIT ROENTGEN RAY AND RADIUM SOCIETY
Secretary, Dr. Henry L. Ulbrich, 1130 E. Grand Blvd.
Meets monthly on second Friday from October to May, at Wayne County Medical Society Building.

THE NEW ENGLAND ROENTGEN RAY SOCIETY
Secretary, Dr. Charles W. Blackett, 35 Bay State, Rd., Boston, Mass.
Meets monthly on third Friday, Boston Medical Library.

NEW YORK ROENTGEN SOCIETY
Secretary, Dr. Eugene V. Powell, 217 East 42d St.
Meets monthly on second Monday, New York Academy of Medicine.

PACIFIC COAST ROENTGEN RAY SOCIETY
Secretary, Dr. Harold B. Thompson, Seattle, Wash.
Two meetings a year.
Meets in Victoria, B. C., during week of June 21–25, 1926.

ROCHESTER ROENTGEN RAY SOCIETY, ROCHESTER, N. Y.
Secretary, Dr. S. C. Davidson, Highland Hospital.
Meets monthly on the first Friday evening at 7.45 at the Rochester Medical Association Building.

ROENTGEN RAY SOCIETY OF CENTRAL PENNSYLVANIA
Secretary, Dr. W. E. Reiley, Clearfield, Penna.
Two meetings a year, April and October.

PHILADELPHIA ROENTGEN RAY SOCIETY
Secretary, Dr. Eugene Pendergrass, University of Pennsylvania, Philadelphia.
Meets monthly on first Thursday evening, Pennsylvania Hospital.

ST. LOUIS ROENTGEN CLUB
Secretary-Treasurer, Dr. L. R. Sante, Metropolitan Building.
Meets first week of each month. Time and place of meetings designated by president.

TEXAS RADIOLOGICAL SOCIETY
Secretary, Dr. Davis Spangler, Dallas, Texas.

RADIOLOGICAL SECTION, AUSTRALASIAN MEDICAL CONGRESS
Secretary, Dr. C. A. Anderson, The Hospital, Dunedin.
Meets at Dunedin, New Zealand, during February, 1927.

BELGIAN SOCIETY OF ROENTGENOLOGY
Secretary, Dr. J. Boine, Avenue des Alliés, 134, Louvain (Belgium)
Meets monthly on second Sunday at d'Egmonds Palace, Brussels, except in the summertime.

BRITISH INSTITUTE OF RADIOLOGY
Secretary, Dr. John Muir, 32 Welbeck St., London, W. 1.
Meets at 32 Welbeck St., but regular dates and times of meeting have not yet been arranged.

THE BRITISH RÖNTGEN SOCIETY
Meets on the first Tuesday of each month from November to June inclusive, at 8.15 P.M., at the British Institute of Radiology, 32 Welbeck St., London; W. 1.

RADIOLOGICAL SECTION, NEW ZEALAND BRITISH MEDICAL ASSOCIATION
Secretary, Dr. P. C. Fenwick, The Hospital, Christchurch.
Meets annually.

ASSOCIATION OF GERMAN ROENTGENOLOGISTS AND RADIOLOGISTS IN CZECHOSLOVAKIA
Secretary, Dr. Walter Altschul, German University, Prag, 11/52.

DUTCH SOCIETY OF ELECTROLOGY AND ROENTGENOLOGY
Meets in Amsterdam every second month except in the summertime.

SOCIETA ITALIANA RADIOLOGIA MEDICA
Secretary, Professor M. Ponzio, University of Torino, Torino.

ELECTRO-THERAPEUTIC SECTION OF THE ROYAL SOCIETY OF MEDICINE (CONFINED TO MEDICAL MEMBERS)
Meets on the third Friday of each month during the winter at 8.30 P.M. at the Royal Society of Medcine, 1 Wimpole St., London, W. 1.

SCANDINAVIAN ROENTGEN SOCIETIES
The Scandinavian roentgen societies have formed a joint association called the Northern Association for Medical Radiology, meeting every second year in the different countries belonging to the Association. Each of the following societies meets every second month except in the summertime:

SOCIETY OF MEDICAL RADIOLOGY OF SWEDEN
Meets in Stockholm.

SOCIETY OF MEDICAL RADIOLOGY IN NORWAY
Meets in Oslo.

SOCIETY OF MEDICAL RADIOLOGY IN DENMARK
Meets in Copenhagen.

SOCIETY OF MEDICAL RADIOLOGY IN FINLAND
Meets in Helsingfors.

VIENNA SOCIETY OF ROENTGENOLOGY
Secretary, Professor Holzknecht, Vienna, IX, General Hospital.
Meets on the first Tuesday of each month from October to July.

FOURTH SCIENTIFIC MEETING OF THE ASSOCIATION OF GERMAN ROENTGENOLOGISTS AND RADIOLOGISTS OF THE CZECHOSLOVAKIAN REPUBLIC, HELD AT PRAGUE, OCTOBER 24 AND 25, 1925

The presiding officer was Professor Jaksch-Wartenhorst, and the business manager was Dr. Altschul.

The present meeting, like the one last year, was well attended not only by members from Czechoslovakia but from other countries as well; and an especially large number of exhibits was displayed.

The association mourned the loss of its council member, Dr. Rudolf Bacher, who died of roentgen carcinoma, a martyr to his profession. During the past year there occurred the seventieth birthday of the president, Professor Jaksch-Wartenhorst, who in honor of this occasion was elected president of the association for life.

GENERAL PAPERS

In the forefront of interest were the general papers delivered by Opitz of Freiburg and Wintz of Erlangen. Opitz discussed the biological foundations of radiation treatment of carcinoma of the uterus. The biological effect of radiation depends according to his views, upon two factors: (*a*) the local effect, which may be either direct or indirect, and (*b*) the general effect. The radiation treatment of cancer is in the main a biological problem. There are many facts to indicate that carcinomatosis is not purely local, and the general disposition which leads to a localization in carcinoma demands treatment just as well. An explanation of the nature of the biological effect has not yet been discovered. Very probably the physico-chemical nature of the colloidal solutions, among which must be included the cell contents and the blood, furnishes the possibility of an explanation. The so-called carcinoma unit dose is regarded skeptically by Opitz, who employs it only as the upper limit for a radiation treatment; a limit which can practically never be exceeded without producing injury. Irradiation is only one factor in cancer treatment and must be supported by other measures adapted to the individual case.

Wintz reported on his experience in the roentgen treatment of carcinoma. He distinguishes two viewpoints in carcinoma therapy: (1) the carrying out of roentgen treatment according to the therapeutic plan of treatment, identical with the destruction of the carcinoma cell, and (2) the treatment of carcinomatous patients which may be subdivided into the treatment of that portion of the body in which the carcinoma is located, and in the general treatment of the whole body as affected by disease and irradiation. Wintz adheres to 110 per cent of the skin unit dose as the necessary quantity for destroying carcinoma. In carcinoma of the portio vaginalis Wintz has obtained 60 per cent cures in operable cases, five years after termination

of treatment, and 10 to 14 per cent cures in inoperable cases. He next reported the results obtained in mammary carcinoma for three years after termination of treatment. Here the cures were 95 per cent in Steinthal's Group I, 68 per cent in Group II, and 18 per cent in Group III. For the five-year period after termination of treatment, 49 per cent cures are obtained in Groups I and II. Wintz discards the exploratory excision. These figures furnish justification for pursuing the methods used.

The subject of carcinoma therapy was also discussed by Borak of Vienna who recommends the distribution of doses at intervals varying from case to case, with the view of administering a maximum daily dose of roentgen rays, and including study of the effect produced by the last series of treatments so as to take into account the periodic variations in cell sensitiveness. The above three papers were followed by an active discussion participated in by Altschul, Ghon, Gütig, Lahm, and Wagner.

MISCELLANEOUS ON THERAPY

Fried of Worms discussed the roentgen therapy of postoperative pneumonias. He reports having treated 40 cases,—32, or 80 per cent, with very good results, and 8 or 20 per cent, with doubtful or negative results. The dose administered was 160 R (equals 20 per cent of a skin unit dose). This paper was also followed by a vigorous discussion.

Bardachzi of Aussig recommends the method of sterilization for the treatment of myomas and metrorrhagias. The first Freiburg technique is rejected, while the Wintz method of four-field castration or the three-field castration according to Holfelder is to be preferred. The advantage of technical simplicity and maximum avoidance of skin injury is possessed by the distant field method which appears to be adaptable in the case of stout women. In the discussion it was brought out that castration produced at one sitting is generally preferred.

An interesting report was presented by G. A. Wagner and Clara Schoenhof of Prague on the histological and experimental studies upon the problem of so-called stimulative irradiation. They found that small doses of roentgen rays, which produce almost with certainty a clinical acceleration in function in hypofunctioning ovaries, do not produce the destructive effects upon the female generative glands, that are ordinarily seen in the histological picture after administration of larger doses. Schoenhof has also performed biological experiments on white mice. Among 35 women treated for amenorrhea there followed 9 normal pregnancies and the children, one of whom was demonstrated, are growing normally. S. Schoenhof of Prague reported on the indirect action of roentgen treatments upon skin diseases. In 4 women in whom the dermatoses occurred in conjunction with amenorrhea, a stimulative irradiation of the ovaries produced distinct improvement, while the skin symptoms disappeared. In other women, in whom disturbances of menstruation developed as a sequel to the skin conditions, no such effect on the dermatoses could be produced. In the case of alopecia, new hair growth began six weeks after a stimulative irradiation of the hypophysis. The radiation treatment of glands in the neck, and back of the neck, in lupus erythematosus whereby distinct improvement was obtained in some cases rests upon other assumptions. In the discussion Borak pointed out other distant effects following from the irradiation of endocrine glands.

DISCUSSIONS ON ROENTGEN INJURIES

Kriser of Vienna discussed roentgen injuries and briefly summarized the possibilities of preventing such injuries and curing them. He has constructed several devices for the prevention of roentgen injuries. For the therapy of roentgen ulcer he recommends circuminjection with 0.5 per cent novocain solution, with surgical excision as the *ultima ratio*. For the treatment of telangiectases, he recommends the method of Wirz, puncturing of the vessels with a platinum pointed burner or by electrocoagulation.

Epstein of Aussig reported on general blood vessel injuries having the characters of Werlhof's disease following local roentgen therapy, which terminated fatally forty-two days after irradiation. Epstein

regards this as a case of injury to the capillary endothelium due to the toxic action coming from the broken down cells of the irradiated uterine carcinoma.

In the discussion of the above two papers, Weil commented on injuries caused by a poor filter, and Gütig discussed injuries caused by unusual circumstances. Injuries of the eye were discussed by Ascher; and secondary injuries, especially induration, were discussed by Wintz. Fried and C. Schoenhof pointed out the cumulative effect of heat and cold applications. Borak and Reiser take a position against the over-stressing of the dangers of iodization. As regards therapy, Wintz and Gütig favor early surgical treatment and in ulcers caused by soft rays circuminjection can bring about satisfactory results. S. Schoenhof recommends sympathectomy in injuries of the extremities on the basis of a case operated on by Schloffer.

DIAGNOSIS

Thorax. Altschul demonstrated pictures of cases showing temporary relaxation of the left diaphragm as a result of irritation of the phrenic nerve. The name suggested for this condition is "diaphragma molle." Altschul expresses the belief that further progress of such cases will lead to the development of a genuine relaxation.

B. Epstein of Prague reported in this connection a case of relaxation in a very small child with tuberculosis of the left upper lobe. In this case the development of the relaxation could be definitely observed.

Dwořak of Prague demonstrated a case of left-sided dorsal costomediastinal induration. Gurniak of Prague demonstrated a symmetrical calcified tuberculosis and discussed the differential diagnosis of pneumoconiosis.

Bones. Altschul reported on a new angle of exposure which permits the complete presentation upon a *single* plate of both ears in their entire extent, and symmetrically arranged. Several such roentgenograms were demonstrated.

Gurniak demonstrated a case of osteomyelitis of forty-eight hours' duration, which presented a picture resembling tumor.

Jaroschy of Prague discussed the roentgenology of spondylolisthesis, and demonstrated pictures of the pelvis from the university collection, and in addition a case observed clinically. In addition to the sagittal picture a frontal one is usually necessary; in stout persons where the latter is difficult an oblique lateral picture is recommended.

Pokorny of Komotau demonstrated a case of arrested growth and micromelia or pseudoachondroplasia as an end phase of infantile polyarthritis. Pictures were also shown of a bone tumor of the os frontale which at autopsy turned out to be a sister tumor to a malignantly altered goiterous nodule.

STUDIES WITH CONTRAST MATERIALS

H. Adler and Kaznelson of Prague reported on their experience in the demonstration of the bronchial tree. They use 40 per cent iodipin introduced by the transglottic method. The procedure is especially valuable in bronchostenosis and bronchiectases. Borak demonstrated roentgen pictures of bronchostenoses in carcinoma.

Reiser reported on his experience in revealing the spinal canal with lipiodol. The roentgenogram should be taken not only in the recumbent position but also in the upright. He gave a demonstration of the roentgen pictures of cases observed jointly with Schloffer and Herrmann. E. Adler of Prague demonstrated pictures taken with lipiodol in the spinal canal and discussed especially the difficulties in the interpretation of temporary stoppage of the contrast material. Gütig pointed out the disadvantage of the method in the smearing up of the field of operation, to which Reiser responded that in the cases under discuscussion the field of operation was not obliterated.

Kaznelson reported on the demonstration of the gall-bladder according to the method of Graham. He employed tetraiodophenolphthalein-sodium in a dose of 3.5 to 4 gm. in 40 to 50 c.c. water, injected intravenously. He concludes as follows from an experience with over 50 injections: (1) the healthy gall-bladder can always be filled; (2) inability to fill the gall-bladder

indicates with great certainty some pathologic change in the bladder; (3) on the other hand, the good demonstrability of the gall-bladder is to be considered an indication of an intact gall-bladder in the great majority of cases, but not invariably.

In the discussion, Schütze called attention to the combination of this procedure with the old method of study without any aids. Reimann pointed out that the method of Graham permits a direct test of the physiological, pathological and pharmalogical properties of the gall-bladder. Borak and Friedl Pick favor the oral administration of the contrast material, but Kaznelson in his concluding remarks mentioned that in his hands the oral method did not yield such good results as the intravenous.

Müller of Karlsbad demonstrated pictures of a duodenal ulcer with a covered perforation which broke through into the free abdominal cavity shortly after examination.

TECHNIQUE

Bardachzi and Epstein recommend for dosimetry in deep therapy the Fürstenau intensimeter because of its convenience. It is, however, necessary to re-calibrate it iontoquantimetrically from time to time. As a control instrument the radiometer of Holzknecht may be used to advantage. Boldingh of Endhoven demonstrated the "metallix" tube of Philipps, a metal tube possessing the advantage of unbreakability and dispensing with special ray protection.

Mannl of Karlsbad reported on his experience using the "fan" diaphragm and demonstrated the new models.

Palugyay of Vienna demonstrated an apparatus for measurement and adjustment for the roentgen treatment of collum carcinoma of the uterus according to the method of Wintz.

Pordes of Prague demonstrated a foot contact for the simultaneous switching on of the roentgen tube and the cutting off of the room illumination, and vice versa.

Rigele of Prague demonstrated the Pandoros apparatus which is a combination of the therapeutic and diagnostic electron tube apparatus.

PHOTOGRAPHIC TECHNIQUE

Eggert of Berlin presented a discussion of the photographic properties of the various roentgen materials as based on numerous experiments with plates, films and intensifying screens. He showed by means of a number of lantern slides the various kinds of errors in manipulation.

Weber of Vienna reported on his experiments on the problem of optimal demonstration of minimal contrasts in the roentgenogram. From these experiments he has developed a simplified technique of exposure with only two hardness standards of constant milliamperage with varied time of exposure. As regards general intensification, Weber recommends developing the plate until the blackening of the plate is equal to that of a gray spectacle glass (intensification grade 1415) in order to determine the optimum ground darkening during development.

WALTER ALTSCHUL.

TENTATIVE PROGRAM

SECTION ON RADIOLOGY

AMERICAN MEDICAL ASSOCIATION

Dallas, Texas, April 19–23, 1926

WEDNESDAY, APRIL 21

Chairman's Address. A. C. CHRISTIE, Washington, D. C.

Infectious Osteomyelitis: Differential Diagnosis. RALPH BROMER, Philadelphia, Penna.

Discussion to be opened by J. W. Cathcart, El Paso, Texas.

Typhoid Spine. D. Y. KEITH, Louisville, Ky.

New Position for Making Roentgenogram of the Mastoid. AMEDEE GRANGER, New Orleans, La.

Discussion to be opened by Bertram Cushway, Chicago, Ill.

Renal and Other Retroperitoneal Tumors: Value of Radiography and Supplementary Methods. DANIEL N. EISENDRATH and IRVIN S. KOLL, Chicago, Ill.

The Value of the Pyelogram and Cystogram in Abdominal Diagnosis from the Standpoint of the Roentgenologist. BUNDY ALLEN, Iowa City, Iowa.

Discussion to be opened by Thomas A. Burcham, Des Moines, Iowa.

Gastric Retention of Vegetable Matter. LLOYD BRYAN, San Francisco, Calif.

Discussion to be opened by W. W. Watkins, Phoenix Ariz.

THURSDAY, APRIL 22

Pathologic Changes in Lung Tissue as the Result of Foreign Bodies of Long Sojourn. WILLIS F. MANGES, Philadelphia, Penna.

Discussion to be opened by G. W. Holmes, Boston, Mass.

Pleural Effusions, General and Local: Their Recognition, Localization and Differential Diagnosis. L. R. SANTE, St. Louis, Mo.

Roentgenological Study of Hemoptysis. L. REYNOLDS, Detroit, Mich.

Roentgenological Aspects of Various Types of Hernia. JAMES T. CASE and W. O. UPSON, Battle Creek, Mich.

Discussion to be opened by James Masson, Rochester, Minn.

Further Observations on Cholecystography. SHERWOOD MOORE, St. Louis, Mo.

Discussion to be opened by L. P. Gay, St. Louis, Mo.

X-ray Studies of the Appendix, Cecum and Ascending Colon. BENJ. H. ORNDOFF, Chicago, Ill.

Discussion to be opened by T. D. Cunningham, Denver, Colo.

Radium Emanation as a Palliative Agent in the Treatment of Intraoral Cancer. FRANK E. SIMPSON and RAY E. FLESHER, Chicago, Ill.

Biological Effects of Roentgen Rays. E. C. ERNST, St. Louis, Mo.

FRIDAY, APRIL 23

Hodgkin's Disease and Lymphosarcoma, with Special Reference to their Treatment by Radiation. CURTIS F. BURNAM, Baltimore, Md.

Surgical Diathermy as an Aid to Radiotherapy in the Treatment of Malignancy, with Special Reference to Malignancy within the Mouth. W. S. LAWRENCE, Memphis, Tenn.

Discussion to be opened by Grant E. Ward, Baltimore, Md.

The Treatment of Inoperable Carcinomata of the Urinary Bladder with *X*-rays. HENRY SCHMITZ and JOSEPH E. E. LAIBE, Chicago, Ill.

The Psychoneuroses of the Artificial Menopause. JAMES A. CORSCADEN, New York City.

Shortening the Quarantine Period for Diphtheria Convalescents and Carriers. ETHEL D. HUMPHREYS, SANFORD WITHERS, and JOHN R. RANSON, Denver, Colo.

Roentgen Therapy of Exudative Iritis. E. C. SAMUEL and E. R. BOWIE, New Orleans, La.

A Clinical Study of Leukemia, as Observed under Radiation Therapy. WM. S. STONE, New York City.

Chairman: A. C. Christie
Vice-Chairman: H. M. Imboden
Secretary: M. J. Hubeny.

CENTRAL ILLINOIS RADIOLOGICAL SOCIETY

The regular meeting of this Society was held in Decatur on January 24, 1926.

Dr. Harold Swanberg of Quincy discussed the necessity of concerted action on the part of all who are interested in radiology to secure a Section of Radiology in the Illinois State Medical Society. It was decided that our Society should cooperate fully with the Chicago Roentgen Society in preparing a program for a radiological meeting to be held at the same time as the state meeting.

Dr. H. W. Grote of Bloomington gave a very interesting talk on his trip abroad during the past summer.

Dr. W. C. Bain of Springfield discussed "The Roentgen Analysis of Diseases of the Bones and Joints." He stated that, in his opinion, the roentgenologist was perhaps too ambitious in attempting to make from a film or plate, the sort of diagnosis which should be reserved for the microscopist.

Dr. E. G. C. Williams of Danville reviewed "The Year's Progress in Roentgen Therapy."

Dr. C. J. McCullough of Decatur reviewed "The Year's Progress in Roentgen Diagnosis."

Officers elected for the year were:

President: Harold Swanberg, M.D., Quincy.

Secretary: H. C. Kariher, M.D., Champaign.

C. J. MCCULLOUGH,
Secretary.

"X-RAY MAN" OR ROENTGENOLOGIST

To the Editor:

The following letter was recently received, illustrating the unfortunate nomenclature which has crept into the medical profession:

"Dr. P. M. Hickey,
University of Michigan.
Dear Dr.:

Our city has recently opened a new hospital and we are in need of a competent X-ray man.

A man who can do X-ray and treatment work can do very well from the beginning.

Can you help us to locate a suitable man?

Very respectfully yours,"

It is to be noted that according to the wording of the above letter, the doctor sending the request is apparently not interested in securing a medical graduate, but simply in procuring what he calls a "man" to do diagnostic roentgenology and roentgen therapy. One frequently feels disposed, on receiving such a letter, to inquire of the writer whether he classes

himself as a "medicine man," or as a "surgery man." If the roentgenologist were not bound by the courtesies of the profession, he would, I think, be referring constantly to the internists as "medicine men" and to surgeons as "human carpenters."

It must be confessed, however, that some of the roentgenologists are themselves lax in the use of the proper terms. A few times, I have heard men who were practising roentgenology speak of their associates as "X-ray men." The use of the term "X-ray doctor" is perhaps open to the question of ambiguity as to whether the individual referred to doctors people with the roentgen ray, or whether he is a repairer of roentgen-ray machines.

Very truly yours,
P. M. Hickey, M.D.

Ann Arbor, Mich.
Feb. 5, 1926.

PRELIMINARY PROGRAM

Annual Meeting of American Radium Society

Dallas, Texas, April 19–20, 1926

I Session, Monday, April 19, 1926
9:15 A.M. EXECUTIVE SESSION

Reports of Committees

10:15 A.M. SCIENTIFIC SECTION

1. Comparison of Some Radiation Effects Produced by Filtered and Unfiltered Radon Implants. G. Failla, M.A., D.Sc., and Max Cutler, M.D., N. Y.
2. The Origin of Cancer. M. J. Sittenfield, M.D., New York City, N. Y.
3. Present Status Concerning Our Knowledge of the Effect of Irradiation on the Generative Organs and the Offspring. Hasley Bagg, M.D., New York City, N. Y.
4. Discussion to be opened by: R. H. Milwee, M.D., Dallas, Texas., H. J. Ullman, M.D., Santa Barbara, Calif.

II Session, Monday, April 19, 1926
2 P.M. SYMPOSIUM ON TUMORS OF THE JAWS, ACCESSORY SINUSES, BUCCAL MUCOSA AND TONGUE

1. Carcinomata of the Mouth with Types and Degrees of Malignancy. A. Compton Broders, M.D., Rochester, Minn.
2. Benign Tumors of the Oral Cavity. Frederick M. Johnston, M.D., Atlanta, Ga.
3. Surgery and Radiation Therapy in Carcinoma of the Tongue. Frank E. Simpson, M.D., and Roy E. Fletcher, M.D., Chicago, Ill.
4. Malignant Tumors of, and in the Region of, the Jaw. Joseph C. Bloodgood, M.D., Baltimore, Md.
5. The End-results of the Treatment of Malignant Tumors of the Antrum. Gordon B. New, M.D., Rochester, Minn.
6. The Plastic Repair of Defects Caused by Surgery and Radium in Cancers of the Mouth and Cheek. V. P. Blair, M.D., St. Louis, Mo.
7. Discussion to be opened by: Charles F. Bowen, M.D., Columbus, Ohio, Douglas Quick, M.D., New York City.

III Session, Tuesday, April 20, 1926
9 A.M. SHORT BUSINESS SESSION
9:30 A.M. SYMPOSIUM ON CANCERS OF THE BREAST

1. The Pathology of Breast Cancers with Special Reference to Metastases. Burton T. Simpson, M.D., Buffalo, N. Y.
2. The Surgical Treatment of Carcinomata of the Breast. Report on the Years 1918–19–20. Robert B. Greenough, M.D., Boston, Mass.
3. The Deleterious Effects of X-rays to the Human Economy, with Special Reference to the Pleura and Lung. Arthur U. Desjardins, M.D., Rochester, Minn.
4. Discussion to be opened by: William C. MacCarthy, M.D., Rochester, Minn., Joseph C. Bloodgood, M.D., Baltimore, Md., Emil G. Beck, M.D., Chicago, Ill.

IV Session, Tuesday, April 20, 1926
2 P.M. SYMPOSIUM ON DISEASES OF THE PELVIC ORGANS

1. The Significance of the Histological Malignancy Index for the Prognosis and Treatment of Carcinomata of the Cervix Uteri. Henry Schmitz, M.D., Lloyd J. Arnold, M.D., and Wilhelm Hueper, M.D., Chicago.
2. The Element of Trauma in the Etiology of Carcinoma of the Cervix and the Treatment of Early Cases by Radium. Daniel T. Quigley, M.D., Omaha, Neb.
3. The Rôle Played by the Ureter in Radiated Cases of Carcinoma of the Cervix. C. L. Martin, M.D., Dallas, Texas.
4. Technique and Results of Treatment in Urinary Bladder Tumors. Wm. Neill, Jr., M.D., and C. F. Burnam, M.D., Baltimore, Md.
5. Radium in the Treatment of Fibroids of the Uterus; Its Indications and Limitations. Jeff C. Miller, M.D., New Orleans, La.
6. Discussion: B. F. Schreiner, M.D., Buffalo, N. Y., R. B. Greenough, M.D., Boston, Mass., E. C. Samuel, M.D., New Orleans, La.

DEPARTMENT OF TECHNIQUE

Department Editor: DAVID R. BOWEN, M.D., Pennsylvania Hospital, Philadelphia, Pa.

In this department will be published from time to time, as material is available, suggestions for improvement in technique.

AN APPARATUS FOR STEREOSCOPIC ROENTGENOGRAPHY OF THE MASTOIDS

BY JAMES B. BULLITT, M.D.

SAN JOSE, CALIFORNIA

THE technical difficulties of stereoscopic roentgenography of the mastoids are well recognized, and have largely prevented this useful method from being applied to the examination of the mastoids. For several years the writer has busied himself with this problem, having presented the original model of apparatus to the California State Medical Association two years ago.

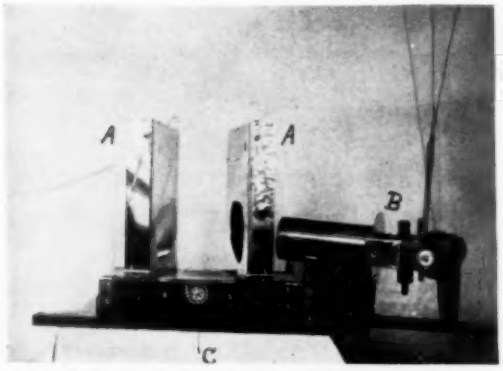


FIG. 1. Apparatus viewed from behind. A, A, plate holders; B, tube carrier; C, wheel for actuating plate holders.

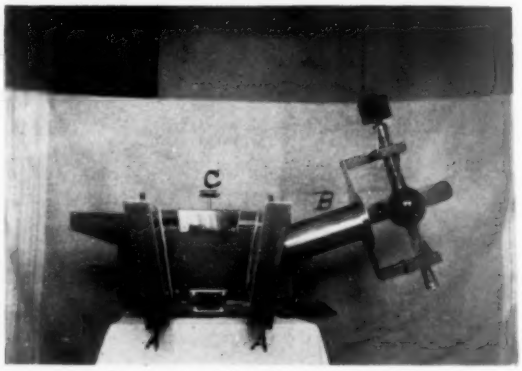


FIG. 2. Looking down on apparatus.

The perfected model here presented renders the examination of the mastoids a certain, simple and rapid procedure. Two 8 by 10 films are used, the two mastoids appearing side by side for comparative examination.

The accompanying diagrams and photographs illustrate clearly the apparatus and the method of its use and render an extended description superfluous.

It will be observed that the patient lies flat on his back, the weight of the head being borne on the occiput and not on the possibly painful and tender mastoid. This position has obvious advantages. The mastoid is in full view and can be accurately placed under the eye to secure the best result. Plates of perfect symmetry can be produced by the accurate technician.

The plate holders serve likewise as the means of fixing the head, being opened or closed by means of a rack and pinion arrangement. Figure 3 shows the lead screen, which protects the film, with the mastoid in place. Figure 1 shows tube carrier (B) in position for first exposure. The stereoscopic shift is upward for the second exposure. The tube carrier is then swung around to the other side for taking the second mastoid.

The diagrams show the exact angles, in both horizontal and vertical planes, which have been found to give the best results.

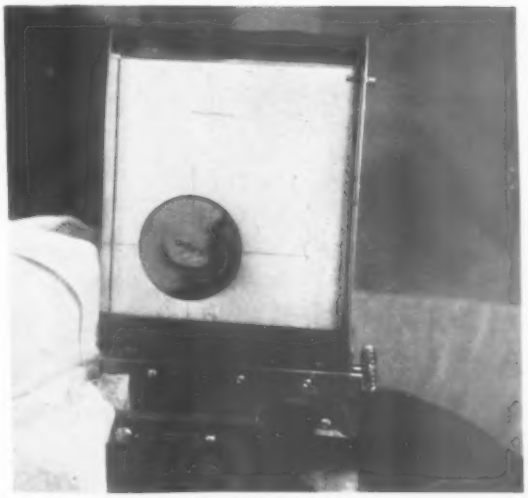


FIG. 3. Apparatus viewed from side with mastoid in place.

FIG. 4. Below, marking board with lead obturators; above, the two completed films ready for stereoscope.

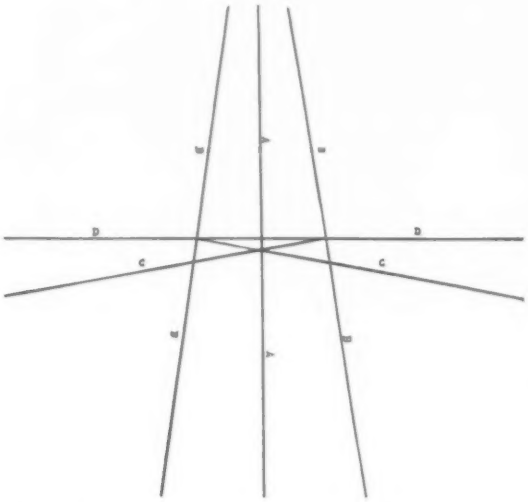


FIG. 5. Diagram showing relation of central ray to plate, to sagittal plane of head and to intermeatal line, in horizontal plane. A, sagittal plane of head; B, B, planes of plate holders; C, line of central ray; D, D, intermeatal line. The line C cuts plane A at angle of 100°, plane B at angle of 92° and line D at angle of 10°.

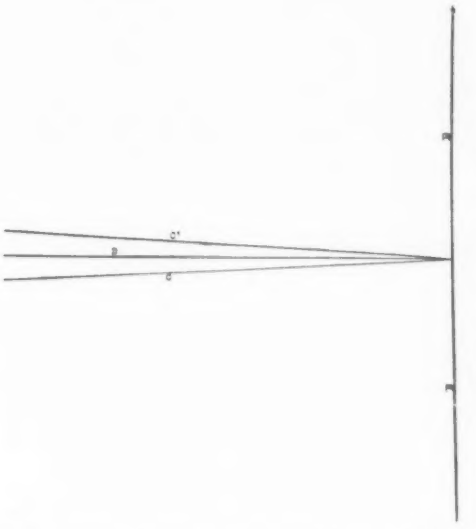


FIG. 6. Diagram showing stereoscopic shift of central ray in relation to intermeatal line, in vertical plane. B, B, plate; D, intermeatal line; C, C′, central ray. C and C′ cut line D at angle of $3\frac{1}{8}°$ respectively.

CONGENITAL DISLOCATION OF THE HIP*

A METHOD OF DETERMINING THE DEGREE OF ANTETORSION OF THE FEMORAL NECK

BY STEELE F. STEWART, M.D., AND ROLLA G. KARSHNER, M.D.

LOS ANGELES, CALIFORNIA

ABNORMAL antetorsion of the femoral neck is recognized as a common intrinsic cause for postoperative retentional failures in congenital dislocations of the hip. Nichols and Bradford[4] in an examination of dry and fresh specimens of congenital dislocations of the hip estimated the antetorsion of different femora as 28°, 45°, 50° and 65°, and Hibbs[2] states that antetorsion of 75° to 90° is not frequent. No more exact statements than these can be found.

Two groups of American investigators[1,6] have studied normal antetorsion. The average figures obtained by these were 11.9° and 14°. Miculicz[3] found an average of 11.7°. The extremes, if we exclude the femur of a ten months' child, was 40° antetorsion, on the one hand, and a retrotorsion of 25°, on the other. It is curious that all the retrotorsions were found in Europe where congenital dislocations of the hip are most frequent.

Sherman,[5] Hibbs,[2] and others have felt that an abnormal degree of antetorsion plays such an important part in causing redislocations that they have practised osteotomy of the femur for its correction. Soutter,[7] on the other hand, believes that antetorsion tends to correct itself after reduction has taken place. But so far as has been found no one has undertaken an exact study of antetorsion in congenital dislocation of the hip in regard to the degree of torsion, its relation to reduction and retention, the influence of age in regard to the degree and the necessity of an osteotomy, and finally of the influence of reduction on the degree of torsion. Two suggestive articles[2,6] have been found but they are only suggestive.

It is our only object at this time to point out a technique which permits the determination of this angle of torsion within from 2° to 5°, reserving for a later paper a study of the other factors involved. We believe that a point which is emphasized so much by orthopedic surgeons on such meager grounds should receive the careful study of roentgenologists and orthopedists, and that the results of such studies should be reported for comparison.

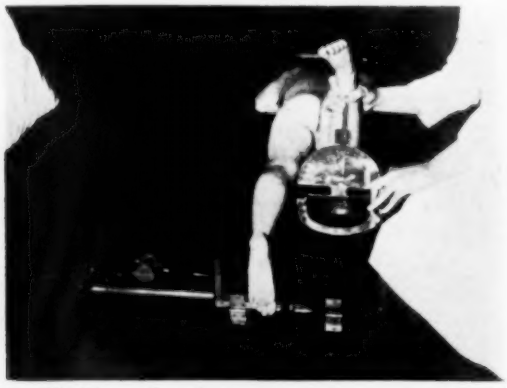


FIG. 1. Position of patient preparatory to rotation of femur.

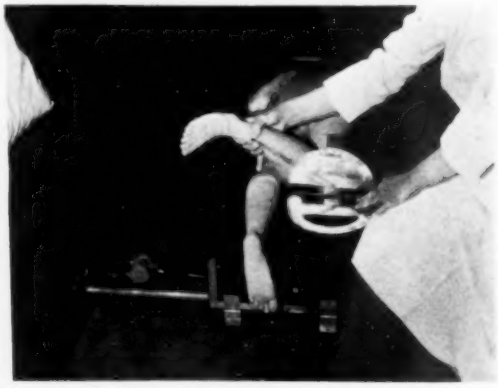


FIG. 2. Position of patient after rotation of femur.

TECHNIQUE

The estimation is best consummated by the orthopedist and roentgenologist working together. To determine the angle of antetorsion of the neck of the femur, lay

* From the Orthopedic and Roentgen Departments of the Children's Hospital, Los Angeles, California.

the patient prone on a horizontal roentgenoscopic table, the knees flexed 90° so that the legs are vertical. A goniometer is placed upon the table (Fig. 1), the dial in contact with the anterior surfaces of the legs, the needle in the long axis of the leg to be measured. It should thus point to zero on the scale. The condyles of the femur are now located by palpation. The distance of their centers from the surface of the table is approximately the distance of the axis of rotation of the lower end of the femur from the same. The dial of the goniometer is consequently raised a corresponding distance. This adjustment eliminates a possible error of about 5°.

The room is darkened. The roentgenologist stands beside the patient facing the head. The roentgenoscopic screen is placed over the hip to be measured, the shutter adjusted so that an area not greater than 5 × 12 cm. on the screen is illuminated. This is large enough to allow a complete view of the shadow of the neck and upper portion of the shaft of the femur. It is desirable to use as small a pencil of rays as possible so that the shadows will be sharper and the rays more nearly perpendicular to the transverse plane of the patient's body. The shadow of the neck will be seen continuous with that of the shaft but deviating inward at a variable angle. These shadows are observed while the orthopedist, holding the needle constantly in the long axis of the leg, carries both across the midline of the patient's body through an arc, the center of which lies in the axis of rotation of the lower end of the femur. This rotates the femur outward, the arc through which it rotates being accurately measured by the needle on the dial. During this process the angle between the neck and shaft of the femur increases, eventually becoming a straight line. If the rotation is continued still further the neck will gradually deviate outward.

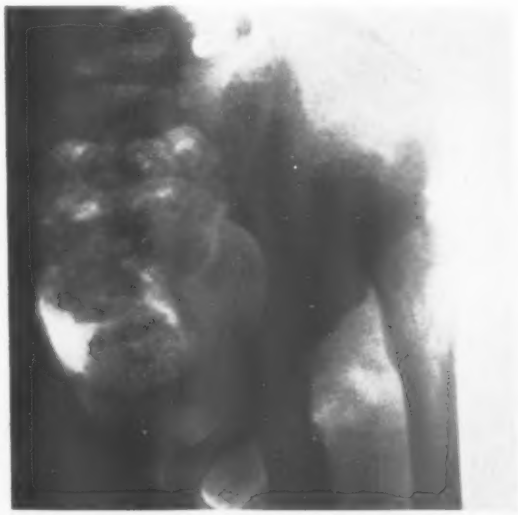


FIG. 3. Dislocation of the hip as it appears on the roentgenoscopic screen. Position of patient as in Figure 1.

FIG. 4. Dislocation of the hip as it appears after rotation of the femur. Position of patient as in Figure 2.

When the point at which the shaft and neck form a straight angle is determined, manipulation is discontinued, and the leg is held stationary (Fig. 2) until the room is lighted and the orthopedist reads from the dial and sets down the number of degrees through which he has rotated the femur. It is best to repeat this complete operation one or more times. A little practice will enable one to obtain almost identical readings, the variation being less than 5° in the most difficult cases. We have frequently checked the accuracy of our own estimations by placing a film over the patient and taking an anteroposterior roentgenogram (Figs. 3 and 4).

It is obvious that the maneuver is applicable only to dislocated hips, the

normal joint permitting only limited rotation of the femur.

Having completed the first step the computation of the degree of antetorsion of the femoral neck is simple. Assume a femur in which the neck joins the shaft without any anterior deflection whatsoever. It would be necessary to rotate such a specimen 90° outward (a full right angle), to make the neck lie in a sagittal plane. Rotation through an angle less than 90° in any given case which would bring the neck and shaft of the femur into a straight line would vary from 90° by the amount of antetorsion already existing in the femoral neck. The following rule therefore applies: Measure the angle of outward rotation of the femur necessary to bring the shadow of the neck into alignment with the shadow of the shaft. Subtract such angle from 90°. The remainder will be the antetorsion of the neck of the femur. Example: Angle of outward rotation 38°. Ninety degrees minus 38° equals 52°, the angle of antetorsion.

REFERENCES

1. Durham, H. A. Anteversion of the femoral neck in the normal femur, and its relation to congenital dislocation of the hip. *J. Am. M. Ass.*, 1915, lxv, 223.
2. Hibbs, R. A. Anteversion of the neck of the femur, in connection with congenital dislocation of the hip. *J. Am. M. Ass.*, 1915, lxv, 1801.
3. Miculicz. Quoted by Soutter and Bradford.
4. Nichols, E. H., and Bradford, E. H. Surgical anatomy of congenital dislocation of the hip-joint. *Am. J. M. Sc.*, 1900, cxix, 629–650.
5. Sherman, H. M. Congenital dislocation of the hip; a rational method of treatment. *Surg., Gynec. & Obst.*, 1914, xviii, 62–66.
6. Soutter, Robert, and Bradford, E. H. Twists in normal and in congenitally dislocated femora. *N. York M. J.*, 1903, lxxviii, 1071–1077.
7. Soutter. Personal communication.

BOOK REVIEWS

Books Received Are Acknowledged under Heading: Books Received. This must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

ULTRA-VIOLET RADIATION AND ACTINOTHERAPY. By Eleanor H. Russell, M.D., S.B., and W. Kerr Russell, M.D., B.S. Cloth. Price, $3.50. Pp. 262, with 77 illustrations. New York: William Wood and Co., 1925.

The history of heliotherapy discloses that the sun's rays have been used in the cure of disease from the very earliest times. Phototherapy was practised by the ancient Egyptians, the Greeks and the Romans. Heliotherapy is therefore not a new form of treatment but a very old practice revived. This takes its place along with medicinal treatment, physiotherapy, dietetics, and climatology as a useful and valuable adjunct in the maintenance of health and the cure of disease.

The book before us is the work of two general practitioners who describe the use of ultraviolet radiation as they have practised it. Their experience leads them to think that general practitioners, after suitable instruction, should use this method themselves so as to make it available to all classes. Indeed, they state that the necessity by no means exists for ultraviolet therapy to be relegated to the specialist. We note, on the other hand, the remark that while there is no difficulty nowadays to obtain sufficient ultraviolet radiation, there is trouble in gauging the correct amount required by the patient.

There is no doubting the reality of the therapeutic effects ascribed to ultraviolet rays. It has often been observed that patients who had languished in wards responded at once when put out on open air balconies. Foul discharging wounds which had resisted treatment immediately began to improve; the men's pale cheeks began to color, their appetites returned and generally their condition improved. Patients convalescing after acute illnesses did particularly well, and equal success was observed in cases of rickets which had not responded satisfactorily to codliver oil treatment. The uncertainties in the quantity and quality of sunlight can, in a large measure, be offset by the use of artificial sources of ultraviolet light.

The authors have used several different types of lamp for producing the ultraviolet rays and found them generally satisfactory. Probably the tungsten arc gives off more ultraviolet radiation than the quartz mercury vapor lamp, but it has some disadvantages when used in general practice. The initial cost is low but the upkeep is greater, because of the price of the tungsten electrodes. Moreover, it produces unpleasant fumes. The carbon arc is mostly used in hospitals where several patients are being treated at the same time. All these different types of lamp have their advantages and disadvantages. The chief disadvantage of the mercury vapor lamp is its fragility and comparatively short life; the tungsten arc, as stated above, fumes and has a high cost of upkeep; the carbon arc requires a longer time for applying treatments. Improvements in the design of apparatus will undoubtedly be made since the whole subject is yet in its infancy. Selective filters will probably be more frequently used than at present.

The subject matter of this book is divided under the following chapter headings: Historical; radiant energy; natural ultraviolet radiation; artificial ultraviolet radiation; chemical properties of ultraviolet radiation; physical properties of ultraviolet rays; biological effects of ultraviolet radiation; technique; conditions in which ultraviolet radiation has been used; skin diseases; ultraviolet treatment of tuberculosis; treatment of disorders of nutrition and of the alimentary and respiratory systems; other diseases in which actinic radiation has been used.

The description of the physical and chemical aspects of ultraviolet radiation is competent and adequate. The methods of determining the intensity of ultraviolet rays are given, and there is also presented useful information regarding the physical properties. Evidence of biological action is shown in the effects on growing seedlings, on bacteria, on the skin, the blood, the alimentary system and on metabolism.

The authors have made a search through the scattered literature and have compiled a list of the conditions which have been treated by ultraviolet radiation and in which the various observers claimed good results. In dermatology there are about fifty different conditions ranging from abscesses to *x*-ray dermatitis. In the alimentary system the range is from congestion of the liver to obesity; in the circulatory system, from anemias to Raynaud's disease; in the genito-urinary system, from amenorrhea to pruritus vulvae; in the respiratory system, from bronchial asthma to whooping cough; in the nervous system, from anterior poliomyelitis to tetanic fits; and in addition to the special senses, the miscellaneous group ranges all the

way from carcinoma of the breast to torticollis. The authors point out that extravagant claims are always made in every type of new treatment, and only experience will make it possible to separate the wheat from the chaff.

The action of ultraviolet rays is explained as follows: The rays are absorbed by the blood and their effect thus transmitted throughout the whole system. The chief general effect is an increase in the rate of metabolism, the appetite is stimulated and the resistance of the body is raised; hence the value of this treatment after acute illnesses in the weakly. The number of microorganisms in the intestinal tract is reduced, absorption is facilitated and catarrh is lessened. The tone of unstriped muscle is increased and obstinate cases of constipation and autointoxication from the bowel are greatly benefited. Anemias are aided by stimulation of the hemopoietic system, and increase in hemoglobin; rickets, from the increase of calcium and phosphorus in the blood; and surgical tuberculosis and many infections by the increase of the bactericidal power of the blood,lymphocytosis, and increase of general resistance. There is possibly a stimulation of the endocrine glands.

Some of these rather broad claims will probably have to be modified.

The manual is clearly printed and illustrated but suffers somewhat from the tendency of reproducing catalogue illustrations from a few indulgent manufacturers. The student of the subject will be disappointed in the bibliography which has not been very carefully edited. But these are relatively minor details. The book in general is a fair presentation of the present state of the subject, and should prove useful as an introduction to ultraviolet therapy.

B. Cohen.

Ultra-violet Rays in the Treatment and Cure of Disease. By Percy Hall, M.R.C.S. (Eng.), L.R.C.P. (Lond.). Cloth. Price, $3.75. Pp. 110, with 23 illustrations. St. Louis: C. V. Mosby Company, 1924.

The past few years have witnessed an awakening of interest in the relation of ultraviolet radiation to health and disease. The various ideas emanating from the laboratory have been caught up by a science-sensitized press and fed to the reading public, usually in undigested or maldigested form. This reading public comprises not only the "man in the street" but the scientist busy in other fields, the physician and others. Dr. Hall has noted the need for an authentic exposition of the subject, and has endeavored to present in brief compass the essential facts in the book under review.

The subject matter is treated under the following headings: Introduction; sunlight; heliotherapy; artificial light; ultraviolet radiation; sources of ultraviolet light; the tungsten arc lamp; technique of the tungsten arc; ultraviolet radiation in skin diseases; ultraviolet radiation in rheumatic diseases; ultraviolet radiation in pulmonary tuberculosis and catarrhal conditions of the respiratory tract; and ultraviolet radiation in various other conditions. These chapters contain a wide miscellany of material disclosing the origin, action, and therapeutic use of ultraviolet rays. Brief case reports are cited showing the efficacy of ultraviolet therapy in a wide variety of conditions.

One cannot escape the impression in reading the pages that the book is written by an advocate and that the material has not been critically scrutinized; but the book does contain a large amount of information which will be found valuable to the radiotherapist.

Most of the illustrations are rather well executed half tones from manufacturers' catalogues; and the present American edition contains six illustrations of various types of American mercury quartz lamps. With very few exceptions these give little more than an idea of the external appearance of the apparatus and their instructional value is about *nil*. Of far better appearance and value are line drawings and diagrams disclosing the arrangement of the important elements of an installation or a device.

B. Cohen.

INTERNATIONAL ABSTRACTS OF ROENTGEN AND RADIUM LITERATURE

ROENTGEN DIAGNOSIS

FLEISCHNER, FELIX. Mediastino-interlobar pleuritis; a frequent occurrence in mediastinal gland tuberculosis. *Klin. Wchnschr.*, Apr. 30, 1925, iv, 875–877.

Examples are cited showing that in the course of tuberculosis of the mediastinal lymph glands there frequently follows an exudative pleuritis of the mediastinal and interlobar pleural spaces, localizing preferably in the right side between the middle and lower lobes. This complication is explained as being due to the close interrelations of certain gland groups of the pleura.

In addition to roentgenoscopy in the oblique position, there is a spinal position which favors the observation of these effusions. This spinal position of "sagittal lordosis" is obtained by having the patient lean with the back of the neck and shoulders against the screen and pushing forward with the abdomen. By this means the large diagonal interlobar spaces approach the horizontal position and can be readily visualized. By slight shifting of the tube and change in the position of the patient an effort is made to outline the shadow boundaries. This introduces an important technique in the roentgen diagnosis of lung conditions. By revealing a mediastino-interlobar exudate in certain cases where "gland tumors" are not entirely demonstrable, an affection (usually tuberculous) of the mediastinal glands covered over by the central shadow can be diagnosed with a good deal of probability. Pleuritic processes of the mediastinal and interlobar pleura can yield enlarged hilus shadows, and the pictures shown confirm the warnings of many writers to regard all enlarged hilus shadows at once as (tuberculous) "hilus glands," or indeed as "hilus tuberculosis."

Two cases are described briefly to illustrate the points made. The roentgenograms taken in the "sagittal lordosis" position show, adjoining the central shadow, a re-arrangement of the previously indefinite shadows to dense, sharply outlined shadows, triangular or shaped like a beak or spur.

FRUMKIN, A. P. Roentgenology of the male urethra. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 401–407.

Twenty-five per cent sodium bromide solution serves as a useful contrast material in the roentgenographic examination of the urethra. In specially sensitive patients it may be advisable to inject previously 15 to 20 c.c. of a 3 per cent cocaine solution with antipyrin. The following technique is employed in the examination. The bladder is emptied just prior to examination and the patient lies on his back with the right leg stretched out as far as possible and fixed with a sandbag. The left leg and thigh are strongly flexed and adducted and held in this position by an assistant. This turns the patient slightly toward the left. The roentgen tube is pointed from above obliquely downward to the left with the central ray directed toward the right side of the root of the penis. A plate is fixed beneath the buttocks of the patient so that the right edge touches the tuber ischii, thus projecting the penis upon the middle of the plate. The penis is then stretched along the left thigh and a 100 c.c. syringe inserted in the urethra. The contrast fluid is injected, and as soon as opening of the sphincter is felt the exposure is begun and continued until 50 to 100 c.c. of fluid has been injected.

This method does not permit a visualization of the whole extent of the urethra because of the surrounding bony structures, but it is possible to see a portion of the pars membranacea distinctly.

The method is of undoubted value in the study of urethral strictures and fistulas. Four illustrative cases are cited briefly.

ESKUCHEN, KARL. The diagnosis of spinal subarachnoidal block. *Klin. Wchnschr.*, Apr. 30, 1925, iv, 870–875.

Spinal subarachnoidal block, total or partial, is considerably more frequent than is generally believed. Its recognition and localization are in most cases possible with the diagnostic aids now at our disposal.

No definite conclusion can be drawn as to the location of the spinal block from the composition of the spinal fluid obtained by lumbar puncture. The quantity of spinal fluid thus obtainable and also the quantity of air that can be injected at the same point yield at most only a very uncertain idea as to the site of the block. When sufficient air is injected interlumbarly to produce pain due to pressure or tearing more definite localization of a spinal block is possible.

The roentgenogram of the spinal column should be regularly employed in the determina-

tion of the diagnosis. By means of spinal injections of air it is possible roentgenologically to determine the level of the air bubble and thus the localization of the lower boundary of the block. This procedure is however sometimes useless because of the difficulty in observing anything distinctly. In 3 out of 4 cases useful evidence was obtained which in 2 of the cases led to successful operations. The ideal method for diagnosing this condition is the iodol test (cisternal or lumbar injections of iodipin). It is however to be considered with all due precautions since the question as to the possibility of erroneous interpretation is still undecided. In the general diagnosis of block this method furnishes a secondary line of evidence. It is at least not always possible to draw a conclusion from the form of the iodipin silhouette as to the nature of the process involved. The iodipin method was successful in 3 cases in localizing the lesion. In one case it was fairly indicative; in one case it shared the blame for a false diagnosis, and in one case it appeared to fail altogether. In the negative cases the result with the iodipin test confirmed the clinical diagnosis. Operation in 3 positive cases confirmed the diagnosis. Brief descriptions are given of 3 of the cases.

GASSUL, R. The technique of improved lung apex roentgenography. *Deutsche med. Wchnschr.*, April 17, 1925, li, 655–656.

When customary dorsoventral and ventrodorsal roentgenoscopy fails to reveal suspected apical infiltrations, a further examination is made in the following manner: The patient stands or sits, back to the screen, with the arms crossed upon the abdomen, humped up as much as possible, the neck stretched forward and the chin upward. The roentgen tube is tilted so as to be centered on the jugulum. Roentgenoscopy in this position shows up the full apical fields and any infiltrations hidden in the intercostal spaces become visible. If the patient is made to bend slightly to either side and slowly straighten up, all portions of the lung apices can be visualized. This whole procedure requires hardly more than half a minute longer than the usual method.

GEIST, EMIL S. The accessory scaphoid bone. *J. Bone & Joint Surg.*, July, 1925, vii, 570–574.

Many surgeons are not yet sufficiently acquainted with this normal structure (os tibiale externum) and mistake the accessory scaphoid for a piece of bone broken off from the scaphoid. The accessory scaphoid bone occurs in from 10 to 14 per cent of normal feet. It is often unilateral and is easily shown by the roentgen ray.

For the past ten years the author's attention has been drawn to the subject of painful accessory scaphoids. Because of the youth of most of the patients it was believed for a time that this might be a disease process similar to "Legg-Calve-Perthes hip" and "Osgood-Schlatter knee." This view is no longer maintained. The chief subjective symptom is definite pain in the region of the tubercle of the scaphoid bone; otherwise there are no foot complaints. In a few cases there is moderate swelling and occasional redness. The disorder is frequently unilateral and occurs much more frequently in females than in males. The condition occurs more frequently in patients under eighteen years of age. Only a few of the cases were accompanied by signs and symptoms of weak foot. This foot disorder is termed by the author "disturbance of the accessory scaphoid."

This is a separate disease entity which can be differentiated from "weak foot." The pain and tenderness may be due to irritation of the joint between the scaphoid and accessory scaphoid; to irritation of the tendon of tibialis posticus; or inflammation of the bursa between the tibialis posticus tendon and the accessory scaphoid. In treatment, conservative methods should be first tried out. In the stubborn cases, removal of the accessory scaphoid is indicated and relief of the tenderness and pain can be expected.

GRANT, FRANCIS C. Ventriculography. *Arch. Neurol. & Psychiat.*, October, 1925, xiv, 513–522.

A compilation is made of a series of 392 cases of ventriculography, the results of which were furnished from the clinics of the members of the Society of Neurological Surgeons (Adson, Bagley, Cushing, Davenport, Dowman, Elsberg, Hodgson, Horrax, Locke, Mixter, Naffziger, Rand, and Sachs). In spite of inexperience with this method, positive information as to the position of the tumor was obtained in 79.3 per cent of the cases in this series. In 30 per cent of these localized cases ventriculography gave definite facts as to the location of the neoplasm when all other evidence was lacking, and in nearly half of the cases in this group the tumor was removable by surgery.

The errors in technique are high but the number of operations performed uselessly due to misinterpretations of the ventriculogram was less than 1 per cent. The mortality rate is more than 8 per cent; but in comparison, the

mortality rate from unlocalized and unextirpated intracranial neoplasms is 100 per cent.

Summarizing, this review indicates that ventriculography is undoubtedly dangerous and will not make a definite localization of neoplasm in every instance. It should not be used indiscriminately. Every other means of arriving at a correct localization should be exhausted first. If one is convinced that the patient has a brain tumor the location of which is unknown, it then becomes a question of expediency. Ventriculography may afford more positive information about the situation of the lesion than any other procedure. No patient should be given a hopeless diagnosis because of unwillingness of the clinician to risk an immediate mortality through the use of air injection.

HUDSON, BERNARD, and SUTTON, PERCY G. The value of soft-ray technique in pulmonary radiography. *Lancet, Lond.*, Oct. 17, 1925, ii, 805–806.

A roentgenogram of a tuberculous lung may be made to show a very different picture according to the quality of roentgen rays employed. The hard rays will penetrate an early focus and give an appearance similar to that of normal tissue. Old fibrotic foci are opaque. The hard-ray roentgenogram is likely to show the older and healed lesions, entirely missing generally the more recent and much more important earlier foci. Experience shows that a recent pulmonary lesion in an early case or a new focus in an old case may be detected by the soft-ray technique before definite physical signs have made their appearance. These early infiltrations appear as fluffy, indefinite, cotton wool-like shadows.

The technique for obtaining good soft-ray roentgenograms includes duplitized films between two intensifying screens, focal film distance one meter. The rays are delivered from a double focus Coolidge tube, 40 ma., 45 kv. secondary voltage, exposure 0.5 to 1 second, according to the thickness of the subject.

LANDAU, W. The roentgen diagnosis of bronchiectasis with the aid of contrast oil. *Deutsche med. Wchnschr.*, July 3, 1925, li, 1115–1116.

On the basis of animal experiments and an experience with 18 patients it is concluded that the use of iodipin is a definite aid in the roentgen diagnosis of bronchiectasis. Doubtful cases were definitely diagnosed when iodipin was used. It is claimed that the German preparation, iodipin, is fully equal to the French lipiodol in production of roentgen shadows and in the extent tolerated.

LANDAU, WALTER. The intratracheal application of iodipin for contrast production in the roentgen diagnosis of respiratory organs. *Klin. Wchnschr.*, Sept. 24, 1925, iv, 1861.

A critical consideration of the facts reported in the literature, taken together with actual experience leads to the following conclusions: Iodipin and lipiodol appear to be equivalent so far as their effectiveness is concerned and the ability to tolerate them. Although the major portion of the injected oil is coughed out, there occurs very probably a resorption of a certain portion. The speed of absorption and the quantity absorbed are unknown factors that need to be studied. The roentgen contrast study of the lungs is considered to be an important advance in the diagnosis of bronchiectases. The visualization of cavities by this method will be facilitated only in occasional cases and a negative result is not necessarily final. On the other hand, the method may yield a possible result in otherwise doubtful cases, so that its use is justified on this ground.

Objection is made to the view of French workers who regard the non-penetration of contrast oil in certain areas (for instance, in the apex) as due to impassability of the corresponding bronchial region. Where only a single examination is possible the chances of failing to inject a particular area are much too great to permit making a decision on a negative finding.

The method is considered useful in the recognition of bronchocutaneous and pleuropulmonary fistulas.

LENK, R., and HASLINGER, F. Roentgen studies on normal and diseased bronchi after filling with lipiodol. *Klin. Wchnschr.*, Aug. 6, 1925, iv, 1533–1535.

Lipiodol is claimed to have a somewhat favorable therapeutic effect in that it distinctly decreases the secretions of the bronchial mucosa. However, it yields relatively little from the diagnostic viewpoint because the same information can be obtained by other methods. Its main utility diagnostically is in the outlining of bronchiectases. However, even this feature is not always easily and definitely accomplished. The technique of administering lipiodol is different from that practised by other workers in that the material is injected directly into the particular bronchial branch desired, and not merely into the larynx. For this purpose, a flexible hollow sound is introduced with the aid of a bronchoscope into the bronchus of

the particular lobe which it is desired to study.

Direct roentgenoscopic observation while the material is being fed into the bronchus shows the greater portion of the material resting in the larger bronchial branches from which it is fairly rapidly ejected in coughing. The remainder sticks to the walls of the bronchi and is usually expectorated within twenty-four hours. When, however, for some reason the cough reflex is absent for a little while, one may observe the contrast material go into the smaller bronchi and bronchioles. Following that, there can be seen smaller or larger irregularly bounded, round or oval spots of contrast substance which represent accumulations in the acini and the pulmonary alveoli. This picture in the healthy lung is such as to give a perfect resemblance to the pouch-shaped bronchiectasis. Differentiation is possible only with the aid of careful roentgenoscopy. This is a case where the roentgenoscopic method is preferable to the photographic.

Lipiodol lying in the bronchi is coughed up in a few hours but that which reaches the alveoli remains for months and disappears ultimately by resorption. A similar mechanism is probably operative in the recovery from pulmonary infiltrations. The contrast material very frequently accumulates, even against the force of gravity, along the lobe interspaces apparently because of a specially close relation between the latter and the main bronchi. This fact explains also the specially frequent beginning of pulmonary processes, such as pneumonias, at the lobe edges.

From a technical standpoint, it is recommended that filling of the alveoli be avoided.

Lewin, Philip. Arthrogryposis multiplex congenita. *J. Bone & Joint Surg.*, July, 1925, vii, 630–636.

Arthrogryposis is defined as a persistent flexure or contracture of a joint. It is of unknown etiology and characterized by congenital deformities and limitations of joint motions. A description is given of 2 cases. The pathology is confined to the articular and periarticular structures. The deformity consists of clubbed hands and feet with limitation of motion of all joints. Roentgenograms reveal the exact conditions of the joints. The diagnosis is very easy; and in the knee it is necessary to rule out congenital genu recurvatum which is manifested by abnormal mobility in extension with limited flexion and usually transverse creases over the extensor surface of the knee.

The treatment consists of gradual correction of the deformities accomplished in several stages, but the prognosis is very poor.

McGrigor, D. B. Radiology (in arduis fidelis). V. Routine radiography. *J. Roy. Army Med. Corps, Lond.*, July, 1925, xlv, 17–28.

An outline is given of routine procedure in the roentgenography of the common sites, taking into account the special circumstances of military medical service. A description is given of the preliminary procedure in locating land marks, etc., roentgenographic technique and preparation of the patient. Following this is given a systematic outline of the examinations of the upper extremities, lower extremities, trunk, chest, urinary tract, abdomen, gall-bladder, head, accessory sinuses, and sella turcica and of the teeth.

Mayer, Ernst G. The roentgen findings in chronic otitis. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, 1925, xxxiii, 495–503.

It is seldom possible to make a diagnosis of chronic otitis merely upon the basis of the roentgen picture, because usually the otological diagnosis requires no such confirmation. On the other hand, the roentgenogram may give an exact description of the variations from the normal, and anomalies in bone structure that may be important from the standpoint of treatment.

The pneumatic system in chronic otitis shows extensive deviations from the normal. The pneumatic cells in the mastoid may be entirely absent in chronic otitis or else show a rudimentary, thick-walled, irregular system confined to the vicinity of the antrum, or scattered sparsely throughout the mastoid. The pneumatization process is a function of the normal mucosa and injury to the latter during the period of development results in a disturbance which in severe cases is responsible for complete prevention of the cell formation. The disease of the mucous membrane may heal completely, but it is known that the pathological changes in the form of hyperplasia of the mucosa or fibrosis is the basis of a disposition to subsequent chronic inflammations. Judgment of the degree of sclerotization, whether physiological or pathlogical, from the roentgenogram is difficult. Only the extreme cases such as eburnation and complete preservation of the spongiosa structure can be well differentiated,—the intermediate forms cannot be precisely estimated. More important than this is the demonstration and localization of the cells that are present. This is difficult and requires experience. Cells distributed like a bunch of grapes near the antrum are easily recognizable in the periantral region often as pinhead rarefactions of uniform outline. Occasionally there is observed an isolated complex of cells in the petrous angle. Sometimes the cells

are in the form of a chain extending from the antrum to the petrous angle. In other cases the antrum may branch out and extend up to the petrous angle.

The aditus and antrum in the roentgenogram always has the same position between the labyrinth nucleus and the posterior wall of the auditory passage. In chronic otitis it usually undergoes considerable change either of apposition or of destruction. The inflammatory reaction may cause progressive sclerosis in the bone with a consequent narrowing of the lumen. The destructive processes, usually due to cholesteatoma, almost never result in a uniform widening of the aditus; but they usually destroy the anterior wall either from the attic or from the antrum. The end result is a large common defect in which the antrum, aditus and attic can no longer be differentiated. It has a characteristic shape and fairly regular outline, provided there is no acute exacerbation.

A complete description of the pathological changes is hardly possible because of the great number of individual variations in structure. This constitutes the greatest difficulty in this field. The differences are due mainly to the varying development of the pneumatic system. Another difficulty is lack of an adequate technique in making roentgenograms. It is not believed that the Bucky diaphragm can be of much use in this field. The author's procedure to avoid the disturbing effect of scattered radiation is to cut down the primary beam and use a conical tube 2.5 cm. in diameter at the roentgen tube, and 5.5 cm. at the other end, with a length of 30 cm. The lower opening is just big enough to take in the pyramids and the mastoid. This makes roentgenographing rather difficult but so far nothing has been suggested that produces such sharp roentgenograms rich in contrast and detail.

MEINICKE, ERNST. Regarding the technique of improved apex visualization in the lung roentgenogram. *Deutsche med. Wchnschr.*, July 3, 1925, li, 1115.

The roentgenoscopic method suggested by Gassul is recommended as very satisfactory. This method involves roentgenoscopy in the ventrodorsal position with the patient hunched as far forward as possible. It is again emphasized that examination in this position must be supplemented by examination of the patient in the erect position. Otherwise shadows of the hilic structures may be projected into the apical field and give an erroneous impression. Moreover densities normally visible in the apical region are projected out of the range of vision when the forward hunched position is assumed.

NEUSWANGER, C. H. Iodized oil as a pyelographic medium. *J. Am. M. Ass.*, June 13, 1925, lxxxiv, 1816.

A preliminary report is given of some experimental work on the use of iodipin (40 per cent, Merck) as a pyelographic medium.

Twelve injections were made in each of a series of dogs, 4 to 5 c.c. of the iodized oil being used for the pyelogram and an additional 0.5 to 1 c.c. for the ureterogram. In each instance well-defined pelvic and ureteral shadows were obtained. The animals were free from symptoms for the fourteen days they were observed.

The iodized oil has been used on a few human subjects with striking results and no unusual symptoms. The outlines of the pyelograms were unusually distinct, especially those of the calyces of the pelvis. The ureterogram was easily followed even when superposed on the vertebral column or pelvic bones.

MIXTER, WILLIAM JASON. The use of lipiodol in tumor of the spinal cord. *Arch. Neurol. & Psychiat.*, July, 1925, xiv, 35–45.

Observations in human and in animal experiments have shown that lipiodol may adhere to the meninges or to the nerve roots in droplets or even in large masses causing the appearance of definite blocking of the cerebrospinal canal. This is the "false arrest" described by French observers. One would suppose that a drop of mercury placed in the arachnoid space of a cat would be rolled around as one runs mercury around the bottom of a beaker. It was found, however, that mercury was about as difficult to move in the cerebrospinal space as lipiodol and it was necessary to shake the cat much as one would a clinical thermometer.

In cases of suspected compression of the cord, lipoidol has been injected into the cisterna magna, lumbar injection being reserved for the cauda equina. Outlining of the upper and lower limits of the same tumor has not been attempted because of the double dose of lipiodol demanded; of the two, the upper limit is the more important. Cervical and dorsal injection has not been attempted because the danger was disproportionate to the advantage. Such a substance as lipiodol should not be injected into the cerebrospinal space unless the possible dangers are more than outweighed by the more exact diagnosis to be obtained. The use of lipiodol is advised against unless spinal block has first been demonstrated. The interpretation of the films is of great importance. Occasionally the lipiodol tends to move slowly and even to stop and pile up in the canal for a short time. This temporary arrest is of little or no significance. Rounded masses of oil sticking irregularly

in the canal for a few hours are of no significance. The shape of the oil shadow, particularly its lower border is important. A cap or crescent complete or incomplete means extramedullary tumor or Pott's disease with intraspinal abscess; while narrow lines of lipiodol at either side with an irregular mass above suggests a fusiform enlargement of the cord itself. An attempt to remove the oil at operation was not very successful. An irritant action observed by Ayer and Mixter may have been due to deterioration in the material used.

Occasionally small tumors or destructive new growths that cause narrowing of the cord are not accompanied by block and lipiodol yields no information. When there is evidence of block, a sharp neurologic level and an indefinite lipiodol level one had better depend on the neurologic evidence. Given a sharp localizing picture with lipiodol and a neurologic level, perhaps two or three segments below, one had better depend on the lipiodol level.

PENFIELD, WILDER G. Cerebral pneumography; its dangers and uses. *Arch. Neurol. & Psychiat.*, May, 1925, xiii, 580–591.

The interpretation of cranial pneumograms depends on a knowledge of the normal variations of the ventricles both obstructed and nonobstructed. It is impossible, however, for anyone to pass a reliable judgment on the plates unless he knows how the injection was made and the positions and preliminary oscillation of the head. Finally, conclusions should be made by one who has, in addition to these facts, a knowledge of the clinical findings as well.

Unfavorable reactions to cerebral pneumography are of different types. In a series of 60 pneumograms there has been no death definitely the result of the air injection; but one patient died thirty-six hours later, for which the air injection may have been partly responsible. There was one case of staphylococcus infection following air injection. In over half of the cases replacement of cerebrospinal fluid by air is followed by a more or less moderate reaction which may consist in a rise of temperature lasting up to four days, or there may be evidence of increased intracranial pressure such as vomiting, drowsiness or complaints of headache. The transcerebral route rather than the lumbar for injection is preferred in cases of increased intracranial pressure.

Cerebral pneumography has been of service in deciding that a lesion localized clinically is not due to tumor when the pneumogram shows the underlying ventricle normal. After a thorough clinical study of a case, injection of air only proves or disproves a suspicion in the mind of the neurologist. Cranial pneumography in properly selected cases is of assistance in localizing tumors and outlining the ventricles before operation. As a procedure it must in no wise diminish the thoroughness of neurological examinations and should not be employed unless these examinations prove indeterminate.

PETRÉN, K., and LAURIN, E. Diagnosis of spinal tumors, with especial consideration of roentgen-ray treatment of tumors and of syringomyelia. *Arch. Neurol. & Psychiat.*, July, 1925, xiv, 1–6.

Roentgen-ray treatment with very good results was given in a case of diffuse myxosarcoma extending along the spinal cord in a woman aged twenty-seven. There was considerable improvement and the attacks of pain disappeared with the first treatment. The ability to walk returned. Various roentgen-ray examinations of the spine were always negative. A metastasis developed in the left groin more than a year later and the patient died of generalized metastasis, with ulceration and sepsis.

The second case occurred in a woman aged forty, who had an intramedullary tumor. There was slight improvement following decompression through laminectomy. Roentgen-ray treatment of the spine was followed by improvement of function of the lower extremities. The type of tumor present was not determined.

In a third case, a woman aged fifty-three had an affection of the right posterior horn involving the fibers of the posterior roots in the fifth lumbar and second sacral segments. Whether these symptoms were due to a springomyelia or to a circumscribed glioma remains undetermined. The course of the disease showed that the roentgen-ray treatment brought about an improvement. The most important result from a practical point of view was the fact that a perforating ulcer in the foot of the patient had healed, and that the foot has remained well for two years.

PICCININO, GUIDO. Roentgen lipiodol diagnosis of the vertebral canal. *Arch. di radiol.*, May–June, 1925, i, 381–384.

Lipiodol diagnosis has hardly justified the enthusiasm with which Sicard and Forestier first reported it, but it still remains a valuable method for the exact objective localization of a lesion of the spinal column when surgical operation is to be performed. The author makes the injection into the occipito-atlantoid space, though it is sometimes made between the 5th and 6th or the 6th and 7th cervical vertebrae. Only one death has been reported from the procedure and that was one in which there was

hemorrhage due to an aberrant course of the posterior inferior cerebral artery. The patients may have fever and headache however and occasionally vomiting and signs of meningism, so it is best not to dismiss them immediately after the injection. It has not proved possible, as was at first hoped, to make a diagnosis of the nature of the lesion from the form of the arrested lipiodol, nor can a very early diagnosis be made; the lipiodol is not arrested at a period earlier than the development of clinical signs. But the value of the method for the definite localization of surgical lesions is illustrated by the case of a young man of twenty-four in whom laminectomy was performed at the level of the 1st and 2d lumbar vertebrae with negative results. As her condition did not improve the author some years later made a lipiodol examination and found the obstruction at the level of the 11th dorsal.

Roentgenograms are given of 4 cases in which the lesion was definitely localized by this procedure before operation.

ROENTGEN AND RADIUM THERAPY

SMITH, MORRIS K., and HOPKINS, J. GARDNER. Radiotherapy in the treatment of tuberculous cervical adenitis. *J. Am. M. Ass.*, July 25, 1925, lxxxv, 262–264.

A study is presented of the results of roentgen-ray therapy in a series of 21 cases treated at St. Luke's Hospital, New York, from the point of view of the relative indications for surgery and roentgen therapy. The period of observation averaged two years. The ages varied from seventeen months to thirty-one years, half of the patients being under sixteen.

Surgical experience as expressed in reports such as that of Dowd has shown that in early cases with a localized mass of involved nodes, excision gives a very high percentage of cures. In such cases permanent cure by roentgen therapy is frequently possible but seems less certain. The possibility that large firm nodes will break down under roentgen-ray treatment must be considered. In choosing the method of treatment for such individual cases the uncertainty and tediousness of roentgen therapy must be weighed against the operative risk and resultant scar after surgical procedure.

There are other cases in which complete excision is impracticable or impossible, many of which can be definitely cured by roentgen therapy. It is not always a question of choice between surgery and roentgen therapy as incision and aspiration are surgical procedures indispensable to success in many cases in which roentgen rays are used.

In 4 out of 5 cases having limited involvement the results were satisfactory after roentgen treatment. One case of axillary adenitis treated with radium applications did not respond satisfactorily. In a group of 9 cases presenting scattered nodes and small abscesses the results of roentgen therapy were considered satisfactory in five. A third group consisted of 7 patients with involvement making dissection impossible. Five had large abscesses and 3 of these responded satisfactorily to roentgen treatment. One was a case of lupus erythematosus on the right cheek of a woman aged thirty-one. The condition was markedly improved after two years, but not cured. The last case was in a colored boy, aged eighteen. There were glands and ulceration extending around the neck from ear to ear. He received treatment for six months, and at the end of four years only scars remained and not a trace of active disease.

TOWNE, E. B. Roentgen-ray treatment of tumors of the brain. *J. Am. M. Ass.*, June 13, 1925, lxxxiv, 1513–1515.

Roentgen-ray treatment of benign tumors has not given good results; these tumors are largely surgical problems. It is believed that roentgen-ray therapy should be used only after the diagnosis of glioma has been made. The tumor should be localized and exploration should be done in order not to overlook encapsulated tumors. If a benign tumor is not found the diagnosis of glioma should be verified if possible by exposure of an infiltrating tumor, or by aspiration of the typical yellow fluid from a cystic glioma. It seems wise to have a decompression performed before starting roentgen-ray treatment because intracranial pressure may be temporarily increased by the irradiation. Failure to explore and to decompress has resulted not only in overlooking operable tumors but in fatalities which may be attributed to the roentgen-ray treatments.

A report is given of the experience with 10 cases of glioma of the brain of which 6 were verified and 4 unverified. In 4 cases the roentgen-ray treatment had no favorable influence; in 4 there was more or less marked improvement which may have been due to the surgical procedures; and in 2 cases beneficial effect was demonstrated by relapse on withdrawal and improvement on resumption of the irradiations. Two illustrative cases from each of these groups are reported. It is concluded that there is no way of predicting whether roentgen rays will have a favorable effect on these particular tumors except by actual test.

WINTZ, HERMANN. The results of roentgen treatment. A statistical report on over 800 carcinomas of the uterus. *Deutsche med. Wchnschr.*, Jan. 2, 1925, li, 19–21.

This report covers the experience of the Erlangen Clinic from 1915 to 1922. Only 6 cases are recorded in which death could be directly related to the roentgen treatment; 2 were due to injury of the mucosa of the bladder followed by perforation, 2 with pelvic ulcers and peritonitis, one of burn over the sacrum and one of pyelonephritis.

The absolute percentage cure (figured on all who applied for diagnosis regardless of whether they were treated with roentgen rays or not) at the five-year period is as follows: Those treated in 1915 showed 19 per cent cure; in 1916, 19.6 per cent; 1917, 13.3 per cent; 1918, 14.6 per cent; 1919, 20.3 per cent; 1920, 21.2 per cent. The corresponding percentages of relative cures are higher. An examination of the statistics shows that in recent years there has been a considerable increase in the proportion of advanced cases applying for treatment. Yet in spite of this the figures show a decided improvement in the percentage cures as the years have gone on. Since considerable improvements in the matter of dosage have been introduced, it becomes clear that statistics based on the five-year cure may not give a true picture. It is suggested that the three-year period may serve as a useful basis since most of the losses following carcinoma treatment occur within two years. On this basis, the operable cases showed 50 to 83 per cent cure for the different years and inoperable cases ranged from 5.5 per cent to 16.4 per cent cure.

Experience shows that a favorable result in the treatment of carcinoma is dependent on an exact technique of irradiation, based on accurate dosage. The slight differences in sensitivity of the various carcinomas play a minor rôle. Another factor is the quality and extension of the disease; the earlier recognized the more favorable for cure. The location of the carcinoma is likewise important, because if in the vicinity of highly radiosensitive organs irradiation becomes dangerous. Efficient medical after care, nutrition, nursing and living conditions of the patient following irradiation contribute to the end result. The "undisturbed retrogressive ability" of the tumor is another governing factor. Local infections, traumatic, mechanical and physical-chemical (endocrine) irritations all produce harmful irritation. Severe general diseases, severe organic disturbances also diminish the resistance of the body to carcinoma. Finally there is the as yet unknown tendency of the body to carcinoma. The existence of this phenomenon is based on the fact that there is a certain proportion, 15 to 20 per cent, that succumbs to the carcinoma despite early recognition and exact treatment.

VOGT, E. The roentgen treatment of benign hemorrhages. *Deutsche med. Wchnschr.*, May 15, 1925, li, 812–814.

Roentgen therapy of non-malignant hemorrhages is based on the fact that the activity of the ovaries can be eliminated temporarily or permanently, as desired. Under the action of the radiation the ovaries become macroscopically smaller, and histologically there is seen destruction of the follicular apparatus and an action upon the blood vessels. The affected follicles are usually eliminated and grow no further, while immature follicles which are uninjured continue to grow and can furnish fertile ova. This is the biological basis for the conclusion that genital hemorrhages are suitable for irradiation which are of ovarian origin. These include myoma hemorrhages and hemorrhages occurring at the beginning of puberty and in the climacterium.

It is emphasized that not all myomas demand treatment; it is only when they cause hemorrhage or pressure symptoms or inflammation that treatment is demanded. The treatment of choice today is roentgen irradiation. Contraindications should be considered; namely, age of the patient, diseases of internal organs, pregnancy, desire to procreate, and condition of the tumor itself. It is especially important that the diagnosis of myoma be definitely established before irradiation is attempted. Severe psychic disturbances, submucous position of the myoma, softening necrosis, infection or sarcomatous degeneration, association with carcinoma of the uterus, complication with malignant tumors of the adnexa and especially uncertain diagnosis are all considered absolute contraindications to roentgen irradiation.

In preparing the patient for irradiation it is of course necessary to put her in as good physical shape as possible. It is no less important to prepare the patient psychically. The aim of the irradiation should be to produce a castration dose in one or two sittings, depending upon the condition of the patient.

The results of roentgen therapy in myomas and in hemorrhagic metropathy are very favorable. The mortality is 0 and the cure 100 per cent for all practical purposes. The average mortality in operation of myomas lies between 3 to 5 per cent.

It is suggested that cases formerly regarded as refractory to radiation treatment are

probably due to faulty technique, and the same may be said for recidives.

MISCELLANEOUS

PARKES, A. S. The effects on fertility and the sex ratio of sub-sterility exposures to *x*-rays. *Proc. Roy. Soc., Lond.*, (*B*), Sept. 1, 1925, xcviii, 415–436.

Published work on the effects of exposure to roentgen rays seems to have been initiated by two main considerations: (1) the histological aspects of testis degeneration caused by exposure, and (2) the effect on the development of the secondary sex characters, and the accessory organs of reproduction produced by obliteration of the spermatogenic portion of the testis. Later work has added strong evidence favoring the view that the hormone produced by the gonad and directing secondary differentiation is produced by some portion of the gonad other than the spermatogenic one, probably by the interstitial tissue. A third line of investigation is possible, i.e., to consider the effects on breeding of exposure to substerilizing doses of roentgen rays. Experiments were performed with the object of studying the breeding performance of mice exposed to roentgen rays insufficient to produce sterility; the main object in view was the effect on the sex ratio. The females in the present experiments were maintained in perfectly normal fashion while the males were subjected to irradiation.

In this investigation Coolidge standard tubes were used, unfiltered, giving a soft medium ray of 0.207 Å. The tube current was 5 ma., 55 to 60 kv., distance 18 inches. The animals were protected so that only the scrotum was subjected to irradiation. It was found that irradiation of the male mouse with substerilizing doses of roentgen rays appeared to stimulate the testis and resulted in peculiarities, notably in the sex ratio in the young from such bucks. Seven hundred and thirty-five normal mice bred under conditions similar to those under which the experimental mating was made gave 379 males and 356 females, a male percentage of 51.6 ± 1.24. Young conceived from irradiated bucks within four days of the date of exposure gave a male percentage of 59.4 ± 2.87, whereas conceptions during the next fortnight after irradiation gave a male percentage of 33.6 ± 2.66. After this the male percentage swings back to 54.4 ± 2.27, a figure very near the normal. The litter size was slightly lower than normal during the first four days after irradiation but afterwards returned to normal. Although various hypotheses explaining the observed results on the sex ratio are considered, it is admitted that little headway has been made toward a reasonable theory covering the whole of the results.

PERONA, PIETRO. A seriograph or selector. *Arch. d. radiol.*, May–June, 1925, i, 406–410.

The study of the pyloroduodenal region by means of series of roentgenograms has developed to such an extent that it necessitates still further improvements in technique to utilize it fully. The author describes and illustrates an apparatus adapted for both roentgenoscopy and roentgenography, so that at any desired moment in the screen examination a roentgenogram may be taken. As one of the characteristic features of this apparatus is the possibility of selecting the most favorable moment for taking the roentgenogram the author suggests for it the name of selector, rather than of seriograph, which might give rise to confusion. The apparatus has the following advantages: (1) Greatest possible reduction of surface and of weight; (2) possibility of the most ample roentgenoscopy and roentgenography of the antroduodenal region and of a large section of the stomach during the ingestion of the contrast medium; (3) immediate control of the roentgenogram taken; (4) maximum rapidity of action; (5) reduction of the amount of roentgenographic material used; (6) easy adaptability of the apparatus to an independent support, to the stand or the trochoscope, and (7) low price.

PHILIPS, HERMAN B. Biplane fluoroscopy in the treatment of fractures: New radiolucent fracture stretcher and new surgical roentgen-ray unit. *J. Am. M. Ass.*, June 13, 1925, lxxxiv, 1824–1825.

A description is given of apparatus offering advantages of simultaneous biplane roentgenoscopy. The arrangement is such as to permit manipulation of fragments of a fractured bone while the limb is in the extension or retention device. The arrangement makes it possible to roentgenoscope or roentgenograph the bones in two planes at right angles to each other with a minimum of delay.

The fracture stretcher is a stretcher with a tubular frame. All the accessories are movable on the frame and can be attached to any part of it. The stretcher is made of aluminum and is radiolucent in all parts within the frame.

The roentgen-ray unit consists essentially of two separate oil immersed roentgen-ray plants incorporated with a Bucky-Potter table. One unit is underneath the table on rails and the other unit is suspended from two upright bars at the back of the table.

REICH, LEO. Medium tube and double focus tube: Their efficiency in roentgen diagnosis. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 369–373.

Roentgenograms were made of a wire screen tilted away from the horizontal and observations were made of the highest vertical distance from the plate to the screen which yielded sufficiently sharp shadows under fixed conditions of operation of the tube. The ratio of this object plate distance to the corresponding object focal distance is known as Heilbron's index of sharpness of the tube. This index of sharpness permits the determination of the minimal focal plate distance necessary for a particular tube to produce a sharp picture of any desired object, provided the object plate distance is known.

A comparative study was made of the index of sharpness of "Media" and double focus (Dofok) roentgen tubes at a fixed focal plate distance of 60 cm. The results show that for roentgenoscopy and roentgenograms taken with less than 20 ma. both tubes are about equivalent. Perhaps the Dofok tube is preferable because it is more often sharper and radiates somewhat more intensely. For roentgenograms taken with more than 20 ma. the "Media" is preferred. When using a Bucky-Potter diaphragm the object is situated about 5 cm. from the plate, consequently the focal plate distance should be fixed at 5 plus 60 cm., or perhaps a little more. Dofok-Bucky roentgenograms are only slightly less sharp but are not less useful than those made with a "Media" tube.

Lung roentgenograms require sharpness and high voltage, and the low sharpness produced by the Dofok tube necessitates an increase in the focal plate distance. Under same operating conditions the Dofok tube requires two to four times the exposure time needed by the "Media."

The tendency to produce roentgen tubes operating at 100 ma. and higher is considered a misdirected effort. A high load militates against a sharpness of the shadows produced. Great sharpness allows a considerable decrease in exposure time by shortening the necessary focal plate distance and this advantage is greater than that gained by increasing the milliamperage. When using a Bucky diaphragm even so-called soft-ray roentgenograms become superfluous.

RIEDER, H. The physiological movements of the small intestine in man. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, 1925, xxxiii, 461–468.

Corresponding to their different functions, the motility of the small intestine and of the large intestine differ quite considerably. In order to study the motility of the small intestine, roentgenograms were prepared in children and young persons. A complete series of roentgenograms taken in one individual is presented. These were made on a healthy, vigorous twelve-year old girl, 24 successive roentgenograms being taken at intervals of fifteen minutes, each exposure being for 0.1 sec. No roentgenoscopy was done in order to protect the child from possible hazard to health.

Each one of the 24 successive roentgenograms is discussed in detail, and taken together they give a consecutive story of the digestive process in the small intestine. In the ileum, with its slow digestion the automatic movements are of a different kind and function from those in the jejunum. In the latter the main process taking place is that of active mixture of intestinal contents with the secretions of the pancreas, liver and intestine by the Kerkring folds, which show up typically in roentgen pictures of the jejunum. There is also in this section of the intestine a variable number of folds of mucosa which tend to prevent a too rapid forward movement of the intestinal contents. Attention is also directed to the characteristic rhythmical segmentation and to the circumscribed and peculiar accumulations of air which are to be seen at various periods of digestion in the ileum as well as in the jejunum.

Peristaltic movement, as such, is only rarely visible on roentgenograms. Usually they are evidenced by their effects (forward movement of intestinal contents), at least in the coils of the jejunum. Of course actual peristalsis is seen when the intestines are roentgenoscoped. In the terminal portion of the ileum, iliac segmentation is to be observed. It is quite pronounced and appears often as a small-waved peristalsis. True peristaltic action is more pronounced in the jejunum than in the ileum. In addition to these various forms of intestinal activity there is still one more which has not been reported before. This appears especially in the ileum and is termed a "dividing and scattering movement." The pictures obtained show that the motor activities in the human small intestine no matter how complex and manifold they may appear, become intelligible when studied in an extensive series, provided that the whole period of digestion in the small intestine is covered.

ROCCHI, G. Methods of protection against the radiations in radium and roentgen therapy. *Arch. di radiol.*, May–June, 1925, i, 410–412.

The author has constructed a table and stand for use in radium therapy to protect the operator. It and the chambers used for pro-

tection against roentgen-ray emanations are illustrated. The table is provided with a layer of lead 2 cm. thick; the radium tubes and needles are handled with forceps at least 20 cm. long. In addition there is a plate of glass before the operator's face.

Roentgen irradiations give rise not only to emanations of rays but also to harmful gases. Various types of cases have been devised for protection against them, but most of them protect only against the rays and not against the gases. The Siemens case which is illustrated protects against both. It is lined with 1 cm. of lead and completely encloses the tube and the high tension wires. One of its walls is completely open and communicates with an opening in the wall between the treatment room and the room where the high tension current is generated. To eliminate the gases completely may require 1 cm. of lead or even more and to avoid the danger from the irradiations there should be a distance of not less than 4 meters between the operator and the current generator.

SEIDE, JAKOB. Biological studies on the problem of radiation stimulation. *Deutsche med. Wchnschr.*, July 17, 1925, li, 1186–1188.

Attempt was made to determine possible stimulative action on the development of the ova of *Ascaris megalocephala* by ultraviolet, radium and roentgen radiations. No evidence whatever could be obtained of a stimulative action by ultraviolet or radium radiation. The radium source was a 10 mg. sample of radium bromide. The ova were exposed for 2 to 60 minutes at a distance of 2 cm. from the preparation.

In the case of roentgen radiation the results were indeterminate. The rays were produced by a modern Symmetrie apparatus with a Müller "metro" tube, 2.5 to 3 ma., no filtration, Sclerometer scale 100 corresponding to 32 cm. parallel spark gap, focus object distance 25 cm. Larger doses were definitely inhibitory; but doses administered 5 sec. to 2 min. produced an occasional acceleration in development as compared with normal controls. This acceleration amounted to 5 per cent on the average, and in one case to 26 per cent. These results with roentgen rays are not regarded as definite proof that there is a stimulative action of roentgen rays, nor do they exclude the possibility of such a stimulative action, as was the case with ultraviolet and radium radiations. Further experiments and a better knowledge of the physiology of cells will be necessary before a definite answer can be given.

The above observations have to do with the effect upon single cells. There is no implication that a stimulative action does not or cannot occur when whole organs or the body are subjected to irradiation.

SHAW, A. F. BERNARD, and SMITH, R. P. Riedel's chronic thyroiditis; with a report of six cases and a contribution to the pathology. *Brit. J. Surg.*, July, 1925, xiii, 93–108.

A report is given of 6 cases of Riedel's struma, all in females between the ages of thirty-two and fifty-eight years. Three of the tumors were in an early stage, the disease being confined to the interior of the gland which showed a peculiar round cell infiltration without appreciable fibrosis. Two of these cases had no symptoms; the other with an unusually bulky tumor had symptoms of compression. In 3 other cases the tumors were relatively advanced, the process having spread outside the thyroid but not sufficiently far to prevent removal. In each case there was fibrosis in the gland; and compression symptoms were present in all.

In 4 out of 5 cases the clinical diagnosis was malignant disease and in one the pathological diagnosis was carcinoma. Two cases with local enlargement were cured by removal, which was done without difficulty; but in one case with involvement of the whole gland partial removal has not cured. Total thyroidectomy cured 2 cases having general enlargement. The only successful treatment at present is surgical; drugs and roentgen rays have proved of no value.

A total of 23 cases has been collected from the literature (1896 to 1924), which shows that the disease is rare. The etiology moreover is unknown.

(See page 466, volume xiii, for report of case of woody thyroiditis apparently cured by roentgen treatment.—Ed.)

SILVERMAN, DANIEL N., and MENVILLE, LEON J. Further observations on the effect of duodenobiliary drainage on the visualized gall bladder. *Surg., Gynec. & Obst.*, September, 1925, xli, 284–286.

Previous experiments have shown that the gall-bladder shadow resulting from the intravenous injection of sodium tetrabromphenolphthalein was reduced in size and altered in shape by a single instillation of magnesium sulphate solution into the duodenum followed by biliary drainage. This reduction in size of the gall-bladder shadow was slight but quite distinct after a single dose of the salt solution followed by drainage. These experiments were extended to other patients in an effort to determine if repeated injections of magnesium sulphate

solution into the duodenum would produce more complete drainage of the gall-bladder.

It was observed that the gall-bladder was reduced in size until there was almost a complete disappearance of its shadow within a comparatively short time. The roentgen-ray technique used was the same as in the previous report. The normal gall-bladder usually requires from sixteen to twenty hours to reduce itself one-half. A pathological gall-bladder shadow visualized twelve hours after injection of sodium tetrabromphenolphthalein was reduced in size 50 per cent within one hour. This was accomplished by the introduction of magnesium sulphate solution directly into the duodenum at twenty-minute intervals followed by duodenobiliary drainage. In another individual, the gall-bladder shadow was reduced in size approximately 50 per cent within two hours. This result was obtained by drainages following four injections into the duodenum of magnesium sulphate.

SITTENFIELD, MAURICE J., and JOHNSON, B. A. Studies upon the biological reactions of growing tissues to radiant energy. I. Effect of radiumized media upon tissue cultures *in vitro*. *Proc. Soc. Exper. Biol. & Med., N. Y.*, May, 1925, xxii, 464–466.

A study was made of the immediate and latent behavior of tissues grown *in vitro* when placed in direct contact with radium salts and radon. Chick embryo hearts from seven to eleven day embryos and spleen from eighteen to twenty day embryos were used. Small fragments were placed in a medium of chicken plasma and embryonic tissue juice. Fine glass seeds about 0.5 cm. long and 1 mm. thick containing 0.1, 0.25, 0.35, and 0.5 to 1.0 mc. radon were placed in direct contact or 1 to 2 mm. away from the tissue. A series of twelve experiments was conducted comprising 100 cultures without radium or with empty glass seeds. In the 133 controls normal growth was observed in 124 cultures and 9 cultures showed either no growth or a very scanty one. In the 100 cultures treated with radon, 49 showed no growth, 30 were markedly inhibited, especially on the side toward the radon seed, and in 21 growth was fair or normal. Cultures exposed to 0.1 mc. radon were affected in practically the same proportion and manner as those with larger amounts.

Other cultures were treated by applying needles containing 5, 10, 25 and 50 mg. radium bromide to the mica cover slip over the small fragment of tissue for varying lengths of time. In the majority of these cultures growth occurred but the outgrowth was studied with fine vacuoles indicating early degeneration. Subculture of these tissues showed complete degeneration in eight to ten days.

SMITHIES, FRANK, and OLESON, RICHARD B. Aseptic irritative phlebitis following intravenous injection of sodium salt of tetrabromphenolphthalein. *J. Am. M. Ass.*, May 16, 1925, lxxxiv, 1494–1495.

The technique recommended by Graham and Cole was followed in the 2 cases reported. In one instance, extensive, obliterating, travelling thrombosis resulted, spreading in spite of treatment so as to require surgical procedure to prevent involvement of major venous channels or embolism. In the second case early and prompt treatment proved effective and formation of a large clot was avoided. Both patients presented general physical impairment of moderate degree. They were of Northern birth but had removed in later life to tropical or subtropical climates where each had become infested with intestinal protozoa and had developed lesions suggestive of early biliary tract malfunction.

It is concluded that in cases presenting a history of long-continued intestinal and hepatic infection use of the calcium salt of tetrabromphenolphthalein is preferable to the sodium salt. Particular caution should be exercised with patients in whom an infestation with protozoa can be demonstrated. It is a question, after all, whether the calcium salt may with propriety be used in such patients, or whether all preparations of tetrabromphenolphthalein ought to be considered as contraindicated in the circumstances mentioned.

STEINBERG, WALTER. A switch for protecting roentgen tubes. *Deutsche med. Wchnschr.*, March 13, 1925, li, 443.

To prevent damage to vacuum roentgen tubes it is necessary that the current heating the filament remain fairly uniform. Should the filament burn out there is danger of puncturing the tube. It is therefore of advantage to introduce an automatic switch in the heating circuit which will prevent the current operating the tube from flowing unless the filament circuit is of satisfactory working strength. Such a switch has been devised by the author. (The present article gives no further description of the switch.)

STENSTROM, K. WILHELM. Review of theories of mechanism of action of radiation in treatment of cancer. *J. Cancer Research*, June, 1925, ix, 190–203.

There is not much hope for some years for the solution of the problem of the action of radiation on tissues. We know far too little

about the physiology and chemistry of the individual cells and their interactions. The immediate action of radiation takes place inside the cell, and how can we expect to find out what happens in it when we know so little about its structure. It has been claimed that radiation can be used to increase or decrease the activity of certain organs and glands and that this change in activity will influence cancer growth. Nothing definite, however, has been proved in this respect.

Summarizing, it can be said that too few facts have been gathered to prove or disprove definitely the theories discussed (Dessauer, Regaud, Pordes, Holthusen, and others). It is more important to carry out adequate experiments than to continue theorizing at present. The radiation itself is a means of studying the intracellular processes occurring, and the study of this alone is scientifically important apart from therapeutic considerations. It seems evident that the end result is due to a combination of several actions—direct action on some of the cancer cells, disturbance of vascular supply, increased activity of surrounding tissues, action of organic by-products (necrohormones), disturbance of colloidal systems, disturbance of cell membrane permeability, disturbance of salt metabolism—and is not, as has often been stated, a pure cauterization, nor is it a pure effect of non-specific immunization. The actions studied are not specific for radiation, but it must be admitted that radiation represents a specific way of attacking cancer which cannot be exactly reproduced by any other means, and this is the reason for expecting better results with this agent than with other agents now used in the treatment of cancer.

STETTNER, E., and WUSTROW, P. On the pathogenesis and therapy of coxa vara. *Deutsche med. Wchnschr.*, May 15, 1925, li, 815–817.

Views as to the etiology of osteochondritis of Perthes are divergent. In explaining these divergencies it may be necessary to study the changes not only in the disease focus, but also in other bones, especially at the zones of growth. The author has observed in certain cases definite disturbances in the nuclei and epiphyseal lines of the wrist and foot which indicate that this disease probably involves a general disturbance of metabolism. The appearance of the most striking evidences of disease in the ankles is due merely to external causes. A similar disturbance is responsible for the clinical picture of coxa vara. It is frequently stated that coxa vara occurs as a sequel to rickets, but close study does not seem to bear out this view. Two cases are cited in which the children were under careful medical supervision and yet developed typical coxa vara. There were no symptoms of rickets or of scurvy, and feeding of antirachitic and antiscorbutic diets produced no alteration in the roentgenologic bone pictures. It is difficult to decide whether this disease is due to congenital or acquired weakness of assimilative powers, or to a disturbance in intermediary metabolism, or to faulty environmental conditions. It may be that all three combine to form a vicious circle. The fact that there is a visible improvement during the summer months indicates that external factors are at play.

Treatment consequently involves suitable dietetic management and building up the vegetative nervous system by stimulation of the skin and by light therapy; and in addition, suitable orthopedic treatment is important. The author has devised a brace for the hips and knees which is useful in the treatment of coxa vara deformity.

STUMPF, PLEIKART. The influence of temperature upon the luminosity of intensifying screens and on the darkening of photographic films. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 377–382.

It is shown experimentally that the luminosity of intensifying screens under the influence of roentgen rays decreases with increase in temperature. On the other hand, the darkening of photographic films increases with increasing temperature. Consequently, when an intensifying screen is placed in contact with a plate there is an opposition of these two effects. In many cases these effects are equal and neutralize each other. In others, there is a predominance of one or the other.

Different kinds of plates and from different manufacturers show great differences in their temperature sensitiveness. The ordinary roentgen plates of commerce are very sensitive to temperature. For instance if the outspread hand is laid upon a single cold roentgen plate covered as usual and illuminated with roentgen rays from the other side either while the hand is still upon the plate or immediately after the hand is removed, it will be found on developing this plate that the palm and other points of contact of the hand will show up. This phenomenon does not occur if the plate is previously gently warmed up to the temperature of the hand.

The effects of temperature are of great practical significance because it can be shown that the body warmth may be responsible for distinct differences in shadows produced. This is especially the case where no intensifying screen is used. In order therefore to avoid such

undesired differences in intensity which may be responsible for faulty diagnosis, the plates or films should not be too cold when placed in use and the interposition of a non-conductor of heat is desirable to avoid local differences in the temperature of the plate.

TENCKHOFF, BERNARD. The effects and rationale of the autoblood and roentgen treatment, a comparison and attempted explanation. *Deutsche med. Wchnschr.*, Aug. 7, 1925, li, 1308–1310.

It is the author's view that the principles of roentgen irradiation and of autoblood treatment are essentially similar, at least so far as concerns inflammatory or bacterial diseases. Roentgen therapy is regarded as a method or subdivision of therapy with autogenous material. The effect of locally applied roentgen rays is of a three-fold nature: (1) a general immunizing action caused by activated substances reaching the blood; (2) local curative action by these substances, and (3) increased local defense reaction of the autonomic system. Although the literature on the subject of autoblood treatment is not as extensive as that on roentgen treatment of local infectious processes, yet all available information shows that the effects following each of these forms of treatment are almost precisely alike.

WEISS, KURT. General lung roentgenogram and isolated demonstration of the apices by the Albers-Schönberg technique upon a 30 by 40 plate taken with the aid of a cassette tunnel. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 367–369.

In order to make a thorough examination of the lung for suspected tuberculosis the Albers-Schönberg technique recommends (1) thorough roentgenoscopic study; (2) a large plate of the lung fields, and (3) an additional roentgenogram of the detail in the apical fields. The matter of expense puts the examination out of reach of a good many who most need it.

The author observes that in an ordinary 30 by 40 plate there is a considerable area below the diaphragm which is useless for lung study. This area is sufficient in extent to take in the lung apices. A frame was therefore constructed fitting over the usual 30 by 40 cassette and held there with springs. In this frame are placed two lead plates, the upper larger one has the outline of the upper thorax, and the lower, small one is semicircular with a radius of 15 cm. This frame or cassette tunnel is so placed upon the cassette as not to cut off anything from the plate. For the roentgenogram of the whole thorax, the larger lead plate is removed and the roentgenogram is taken in the dorsoventral position. After this the large lead plate is replaced, the smaller one is removed and the unexposed semicircle is used for making a roentgenogram of the apices using the exact Albers-Schönberg technique, dorsoventral position lying down, using a cylindrical screen of 13 cm. diameter. The experience with over a thousand roentgenograms by the above outlined procedure has been very satisfactory in establishing early diagnosis and avoiding errors in diagnosis.

WELS, PAUL. Effect of roentgen rays upon tissue respiration. *Arch. ges. Physiol. (Pflüger's)*, 1924, ccvi, 268–273.

Irradiation of the intact animal body or of the surviving organs with roentgen rays fails to exert any effect upon the energy exchange of the tissues. This is additional evidence that the growth-inhibiting effect of the rays is not associated with the energy-yielding reactions of the cell.

WÜRZ, PAUL. Poisoning with barium preparation in roentgen-ray studies. *Deutsche Ztschr. ges. gerichtl. Med.*, 1924, iv, 173–187.

Cases of poisoning with barium preparations are discussed. It is shown that in some instances poisoning may have been due to impurities in the barium sulphate. In other instances the poisoning was due to use of another barium salt in place of the one prescribed as, e.g. using barium sulphide instead of barium sulphate.

WOLFER, JOHN A. Chronic ulcerations in the dog's stomach produced by *x*-ray. *Proc. Soc. Exper. Biol. & Med., N. Y.*, October, 1925, xxiii, 45–47.

Progress in the study of gastric ulcer has been delayed by the fact that it has been impossible to produce experimentally chronic ulcerative lesions in the stomach of the lower animals, notably in the dog. After a number of failures due to insufficient exposure, it was finally discovered that an ulceration which runs a definite chronic course can be produced in the dog's stomach by roentgen rays.

The dog's stomach is delivered as far as possible through an abdominal incision and an incision over the pre-pyloric antrum is made through the anterior wall parallel to the long axis. Bleeding vessels are ligated if necessary. The posterior wall of the stomach is everted through the incision and four sutures are placed in the posterior wall so as to represent the four angles of a square. These sutures are threaded through a lead plate which has an opening 3 cm. in diameter. When these sutures are tied an area of the posterior wall is fixed in the opening

of the lead plate and is then exposed to the rays. An exposure of 150 ma.min., 140 kv., unfiltered, distance 9 in., is given. The fixation sutures are then cut and the wall of the stomach is closed by two layers of sutures. In the relatively small number of dogs which have been examined this method has not failed in producing a chronic ulcer. Brief protocols in 5 cases are given.

BORAK, J., and GOLDHAMER, K. Experimental studies on the roentgen anatomy and pathology of the joints. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 341–358.

What are the factors that favor the development of bone destruction within the joints and periostitis outside? The authors have sought to answer this question experimentally by studies first on corpses and then on living animals. The experimental procedure consisted in the injection of increasing amounts of contrast fluid (potassium iodide solution, concentration of which was inversely proportional to the size of the joint studied) into the same joint of different corpses, observing the effects produced at different sites of injection. Roentgenoscopic study was made of the method of filling the joint cavity, the degree of extension beyond the cavity, and the effect of position of the body, the most striking phases being roentgenographed. In this manner the following joints were studied: shoulder, elbow, wrist, carpometacrapal joints, finger joints, hip, knee, and ankle.

This study on the significance of purely mechanical factors in the extension of joint exudates shows that the fluid has a typical mode of spread in each joint, modified by general physical properties such as quantity of fluid, density, viscosity and capillary properties. The synovial capsule is permeable to aqueous solutions, and the points through which the fluid first penetrates are quite constant. The injected fluid after escaping from the synovial sac spreads outside of each joint in a very typical manner, and this spread is likewise controlled by the physical factors mentioned above.

The repetition of these experiments in the living dog confirmed the observations completely. These results yield a very plausible explanation of the manner in which foci of bone destruction and periarticular periostitis assume their typical locations and of the origin of acute bone atrophy. Clinical, roentgenologic and anatomic observations all agree on the mode of spread observed in these experiments, this agreement being better the nearer the synovial fluids approach aqueous solutions in their viscosity.

ZACHER, F. Roentgenograms made with hard rays. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1925, xxxiii, 250–255.

When a body is traversed by roentgen rays it sends out radiations, and if the latter are hard, as is the case when the primary radiation is hard, this scattered radiation will affect the sensitive layer of the double film and the result will be a fogged picture. If, however, the distance of the object from the tube focus is very great the object is traversed by a smaller quantity of rays, therefore gives off less scattered radiation, and consequently the danger of fogging the film is considerably reduced. Experiment has shown that a well exposed, contrast-rich picture of the lungs is obtained with a focus plate distance of 2 meters using a 25 ma. tube current delivering rays of 11 Wehnelt units hardness corresponding approximately to 85 kv. (effective), exposure time 0.1 second. These factors are, however, not a guarantee for a successful result. It is very essential that the technique of development be efficient. Experiment shows that a concentrated developer should be used and the time of development be stopped at the moment when development fog threatens. This applies to duplitized films, and experiment shows that the effect is due to the superposition of two under-exposed pictures. For instance, if in place of the duplitized film with two intensifying screens, two plates are used with sensitized sides outside, and an intensifying screen in close contact with each of the sensitized sides, and if an exposure is taken and each of these plates developed in identical fashion with concentrated developer avoiding developer fog, there are obtained two under-exposed but clear negatives which when superposed yield the same high degree of contrast that is given by a single duplitized film. Experiment shows that long focus plate distance is an essential for the success of this method; the softer the radiation chosen, the nearer must be the film and object to the roentgen tube.

HERMANN, HEINRICH. Safety device against high tension voltage injuries in roentgen apparatus. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 423–424.

Any contact with high tension lead causes a spark between the person and the conductor. This spark produces electrical waves which can be utilized in switching off the high tension current. By the introduction of a wave detector these waves actuate a switch mechanism which breaks the primary circuit in the transformer.

The circuit described includes an antenna for catching the waves, a grounded detector in circuit with a battery and relay in series. This relay actuates the circuit breaker in the primary of the transformer. This device naturally does not operate if a person is in contact with two poles of the roentgen apparatus which permits the current to pass through him without the production of a spark. To prevent this, it is desirable to coat all metallic portions with a layer of varnish so that accidental contact will cause production of a spark.

CALABRESE, GIULIO A. Some physical factors in dosage in radiotherapy. *Arch. di radiol.*, May–June, 1925, i, 388–390.

Piergrossi wrote an article in the first number of the *Arch. di radiol.* on "The Physical Characteristics of Some Types of Irradiation" in which he said that the only factors which affect the percentage deep dose are: (1) the length of the minimum wave; (2) the filter; (3) the anticathode distance, and (4) the field of incidence.

Calabrese thinks there are other factors involved in determining the percentage deep dose absorbed, namely the time, the type of tube and the type of apparatus used. It makes a great difference whether a residual gas tube is used in which the current does not pass until it has reached a certain limit of tension or an electrone tube in which the incandescence of the cathode permits passage of the current at a much lower tension, thus furnishing a bundle of rays much richer in long wave lengths and requiring greater filtration.

There are also great differences in the type of current furnished by the three chief types of apparatus used: (1) transformer with the magnetic circuit open with an interruptor; (2) transformer with the magnetic circuit closed with or without a wave selector, and (3) transformer with magnetic circuit closed or open with a condenser. The first furnishes a pulsating current with a sinusoidal curve, the second a pulsating current with a sharp peak and the third a practically continuous current. The same voltage may be attained with all the types and therefore the same minimum wave length, but there is a great difference in the length of time during which the tube activated by these different types of current will produce the minimum wave length, and therefore a great difference in the composition of the bundle of rays which will be absorbed in the deep tissues. And not only are there these three types of apparatus but there are differences also in apparatus even of the same fundamental type. Calabrese thinks there is no doubt that these various factors affect the percentage deep dose.

HERZOG, R. O., and GONELL, H. W. Further studies on natural substances and on organisms by means of roentgen rays. *Naturwissenschaften*, 1924, xii, 1153–1155.

A résumé is given of studies on the chemical composition and finer structure of organic materials. The finer structure of polysaccharides in plants depends on their function in the organism. The insoluble reserve carbohydrates in plant seeds are crystalline. These include starch, mannan, galacto-mannan, inulin, lichenin and xylan. On the other hand, glycogen, a readily available source of energy for muscle tissue, yeasts, etc., is amorphous according to roentgenologic evidence.

Study of the albuminoid structural material of tissues was also made. Most of them were found to be non-crystalline by roetgen-ray analysis. The spongin and skeleton of *Nautilus* are composed of very fine crystals; and the chorda of the shark is also crystalline, containing the same substance present in animal cartilage.

HOLZKNECHT, G. Instruction of physicians in roentgenology. *München. med. Wchnschr.*, Feb. 6, 1925, lxxii, 233–234.

The negative results of roentgenological instruction (in Europe) are due to the following factors: (1) altogether insufficient time allowed; (2) practical application without general fundamental training; (3) splitting up of the subject in scattered clinical establishments; (4) as a correction to the last point, unification in an unwieldy group occurs; (5) uniform instruction given to persons of widely differing preliminary training; (6) instruction of physicians not trained in practical medicine and who are therefore unsuited. A consideration of the various conditions would indicate that for the present preparatory instruction to physicians should not be carried on in conjunction with the universities or at most indirectly; and the practical training should be carried on in the central laboratories of large hospitals.

The individual requirements and preparatory training of each physician seeking instruction should first be determined, and the course adjusted so far as possible to give him the greatest benefit. This includes recommendation of suitable books for study, practical work, course and seminar for discussion of current topics. By suitable variation of these different factors a course of instruction can be mapped out that will best develop the individual seeking the instruction and at the same time fit in with the regular scheme of operation of the roentgenological facilities of a large institution.

KOLODNY, ANATOLE. Tissue changes after experimental deep roentgen irradiation. *Am. J. Patbol., Bost.*, May, 1925, i, 285–293.

Study was made of the morbid changes in the liver, kidneys, spleen and intestinal tract in experimental irradiation of rabbits. In one series, the rabbits were exposed to a roentgen-ray energy in proportion to their average weight—about twice the energy to which patients are exposed in the usual intensive deep roentgen therapy. The dose delivered was 1950 "e" units per square centimeter, 5 ma., 200 kv., peak, 0.53 mm. Cu, skin target distance 70 cm., time of exposure 2 hours. The whole body was exposed. In the second series the epigastric region of the rabbits was exposed for one hour, with other conditions of irradiation the same. All the rabbits died from the third to the ninth day after exposure, and there was no appreciable difference in the changes in the organs studied between the two series.

Definite anatomical changes were found in the liver, the kidneys, the spleen and the intestines, which play a certain rôle in the etiology of radiation toxemia. The main features of these histopathological changes are: (1) destruction of lymphocytes which is especially prominent in the spleen; (2) disintegration of erythrocytes in all the organs studied, with abundant hemosiderin formation; (3) degenerative vascular changes with subsequent thrombosis of the vessels. The destruction of the lymphocytes and the disappearance of Malpighian follicles of the spleen with an overgrowth of the reticular elements of the splenic pulp constitute the biological basis of the increase of the coagulability of blood after irradiation.

KRAMARENKO, JURIJ. New technique for performing pneumoperitoneum. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1925, xxxiii, 389–391.

A study of the anatomical relations shows that the most suitable site for puncture to produce a pneumoperitoneum is either in the eighth or ninth intercostal space somewhat medial to the mammary line. The pleura lies $1\frac{1}{2}$ fingers above and cannot be hurt by puncture. After penetrating the abdominal wall the trocar should be pushed inward about 0.75 to 1.0 cm. before moving the mandrin. The trocar is then pushed downward along the inside of the abdominal wall and safely past the edge of the liver, provided the latter is not enlarged. If the liver is enlarged the puncture should be done on the left side. A trocoscope is used to be sure that the needle is actually in the abdominal cavity and that the point of the needle can be moved freely without damage to adjacent structures. After this is assured injection of gas may be made.

During the examination of the patient the needle is either fixed to the abdominal wall or else removed and the opening plugged to prevent escape of the gas. This technique of performing pneumoperitoneum is of the same order of hazard as that of a pleural puncture and can be accomplished with more ease than the methods now in practice.

KRIEGESMANN, L. Experimental determination of the energy used in the ionization of air by roentgen-rays of different wave lengths. *Ztschr. f. Physik*, 1925, xxxii, 542–555.

By means of an air thermometer and a compensation method, the intensity of the radiation was measured by the balancing electrical current. The coefficient of absorption was determined by two methods; and the energy absorbed by air was compared with the number of ions produced by the same radiation. The energy required to produce a pair of ions is calculated for five effective wave lengths of roentgen rays. The harder rays produce fewer ions per unit of energy than the softer rays.

KRAMER, EVA. An extrauterine pregnancy with secondary abdominal pregnancy. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1925, xxxiii, 204–206.

A description is given of a case which was studied roentgenographically and disclosed with great clearness the nature of the condition. The patient was advised a surgical removal of the tumor but refused. The roentgenogram gave a clear outline of the fetal skeleton and showed that there was apparently no envelope around the fetus. A roentgenogram is pictured taken seven years after the first examination. This picture shows the same relative position of the fetus as that found in the beginning. A careful measurement of the fetal bones shows that this was a full-term fetus. There is no sign of deposition of calcium salts, which leads to the conclusion that this is a case of ripe, mummified child.

KROETZ, C. Biochemistry of irradiation. 1. Influence of ultraviolet light and roentgen rays upon the actual blood reaction and upon the stimulation of the respiratory center. *Biochem. Ztschr.*, 1924, cli, 146–166.

The effect of the radiations employed is to influence the blood changes quantitatively. Alveolar carbon dioxide tension decreased 0.6 to 2.3 mm. and remained low for twenty-four hours. Repetition of irradiation within this period did not lower the CO_2 tension further.

The alkaline reserve changed with alterations in CO_2 tension, the CO_2-combining capacity falling from 3 to 11 volumes per cent.

Actual blood reaction underwent several changes, e.g. in the hypocapnia, irradiation caused a decrease in pH of 0.07 to 0.09, and upon further irradiation, a further decrease. The blood tended to come back to normal pH in one hour, after which followed an alkalosis lasting several days. Re-irradiation after twenty-four hours did not raise the pH further. The refractive index of the serum increased owing to an increase in the proteins. Increased acidity of the blood stimulates the respiratory center, and a lowering of CO_2 tension follows. The possible cause of the stimulation of the respiratory center is a disturbance in the equilibrium between cations and phosphoric acid anions.

KROETZ, C. The biochemistry of irradiation. II. Influence of ultraviolet light and roentgen rays on the water, salt and protein content of serum. *Biochem. Ztschr.*, 1924, cli, 449–466.

The water content of human serum increases after irradiation, but this increase is lost after two hours. The protein content also increases, while blood chlorides decrease out of proportion to the water increase. The free CO_2 varies directly with the alkali reserve. Phosphorus increases, and sodium increases more than does chlorine or bicarbonate. Potassium was never found to decrease, and it often increased threefold. Calcium is decreased somewhat. There is an increase in the equilibrium ratio of potassium, phosphorus and calcium as shown by

$$Q = \frac{K(H_2PO_4^- + HPO_4^{--}}{Ca^{++}}$$

This increase is general, and is a fundamental reaction of irradiated organisms.

KRONTOWSKI, A. A. The problem of the biological action of roentgen rays and its investigation by means of explantation. *Klin. Wchnschr.*, Oct. 8, 1925, iv, 1966–1967.

Of the various explanted embryonal tissues and tissues from mature animals, cultures from the spleen, especially the lymphoid tissue, have shown themselves most roentgen-sensitive. The reticular cells and the fibroblasts have been found to be less sensitive to the action of roentgen rays *in vitro* than lymphocytes. A comparison was made of the effects on cultures from the spleen of a mature rabbit and from a chicken embryo. Irradiation with a Coolidge tube (2.5 ma., 0.5 mm. Cu plus 1 mm. Al, object-focal distance 23 cm.) for one hundred or even two hundred minutes permitted satisfactory growth not only of the mesenchyme, but also of the ecto- and endodermal epithelium, whereas the same dose inhibited the formation of a zone of growth in the spleen cultures from the rabbit.

Another series of experiments showed, in contrast to the above irradiations *in vitro*, that similar or even smaller doses applied to eggs containing the developing embryo *in vivo* cause death of the chicken embryo in a very short time. A further study of the above apparently contradictory phenomena showed definitely that, after the administration of these doses of radiation *in vivo* which cause death of the embryo in a short time, tissue cultures made from these embryos shortly after irradiation are able to grow and multiply quite satisfactorily. This satisfactory growth was observed not only in the mesenchyme and the epithelium but also in the embryonal heart.

These facts show that although irradiation of the embryo exposes all the tissues, it cannot be concluded from the fact that the whole embryo succumbs that consequently the dose administered was directly fatal to the embryonal tissues.

LANDAU, WALTER. On the technique of roentgen therapy in pulmonary tuberculosis. *Deutsche med. Wchnschr.*, June 12, 1925, li, 990–991.

Measurement was made of the percentage depth dose in a water chamber at a depth of 10 cm. and through a child's thorax exactly 10 cm. thick. The skin focal distance was 23 cm. and tube was operated with 2 ma., 160 kv., rays filtered through 0.5 mm. Cu plus 1 mm. Al. Kienböck strips were used for measuring the comparative doses. The depth doses thus determined were in each case 20 per cent. This result is surprising in view of the statement of Bacmeister that the absorption in the lung runs almost parallel with that of air. The measurements here given indicate that even in the juvenile lung with incompletely developed structures the absorption is of the same order of magnitude as that by water. Evidently the blood supply in the lung and the expiration phase are sufficiently important to make the net absorption similar to that of other organs.

For purposes of therapy, it should be remembered that the diseased lung has an even greater absorption for roentgen rays than the normal. Studies of the absorption of the lungs in cadavers are considered not applicable in this matter.

MCARTHUR, L. L. Injurious influence of the use of the ultraviolet ray on old *x*-ray burns. *Surg., Gynec. & Obst.*, July, 1925, xli, 97–98.

A report is given of a case occurring in a dentist who drove into his little finger and broke a steel drill. A surgeon made an effort to

remove the fragment under the roentgenoscope. It is estimated that twenty-five to thirty minutes were occupied in the procedure. Eleven days later a severe roentgen-ray dermatitis developed extending from the middle of the forearm to the dorsum of the hand and to the third, fourth and fifth fingers, over the inner half of the back of the hand, and over the tendons of the ring and little fingers. There remained five months later a circular area of white gangrene 2 cm. in diameter. The patient was induced to take ultraviolet-ray treatment. He received an exposure of five minutes at a distance of 6 inches, the dose being repeated one week later. The condition became decidedly worse and the patient refused further treatments. Four months later the destruction of the fourth and fifth fingers was so great as to necessitate amputation.

This is an example of the disastrous effect produced by ultraviolet rays. The latter are not mild and harmless, and their therapeutic effect is not always favorable.

McNally, William D. Two deaths from the administration of barium salts. *J. Am. M. Ass.*, June 13, 1925, lxxxiv, 1805–1807.

In the first case a Filipino, aged twenty-nine, took 4 ounces of barium carbonate in a pint of milk. The physician had prescribed the carbonate in place of the sulphate, and the error was not detected by the pharmacist. The patient died eight and three-quarter hours after ingesting the poison. In the second case, a woman aged fifty-one took a mixture containing 4 ounces of barium sulphide in a pint of buttermilk but was able to drink only half of the mixture. She died three hours after taking the barium sulphide.

Barium poisoning manifests itself by great weakness, salivation and nausea, followed by vomiting and diarrhea. The purging is very violent, causing severe abdominal pains, and at this stage usually the patients become very cold. There is a catarrhal affection of the conjunctiva, the mucous membrane of the respiratory tract and of the nose. Paralysis of the extremities and finally of the trunk next develop. The muscles of speech become very weak early in the poisoning and swallowing is difficult. Consciousness always remains to the end.

The post mortem findings in the above two cases are described, and in this second case the distribution of barium in the various organs was determined.

The barium sulphate given to patients for roentgen-ray examination should be only a chemically pure grade and should be given by the person who is to make the examination. Each lot of barium sulphate should be tested for soluble barium compounds. In this way faulty prescriptions of physicians and careless dispensing by pharmacists would be avoided.

Maki, S. The action of radioactive substances on the isolated uterus. *Biochem. Ztschr.*, 1924, cli, 211–227.

When strips of pig's uterus are suspended in Tyrode's solution and exposed to the rays of radium bromide, thorium nitrate, uranium nitrate or mesothorium, the contractions are accelerated and regulated. These radioactive substances fail, however, to replace potassium or calcium as regulatory substances to uterine contraction in Tyrode solution free from potassium or calcium.

Mottram, J. C. The *in-vitro* cultivation of tissues with reference to the production of cancer by means of radium and *x*-rays. *Brit. J. Exper. Path., Lond.*, April, 1925, vi, 53–62.

Extracts made at 0° C. from the kidneys of adult rats inhibit the growth of kidney cells *in vitro;* and an exposure of emulsified kidney to a temperature of 35° C. for one or two hours before the extract is made destroys this inhibitory factor. Exposure of emulsified kidney *in vitro* to radium has a like action, and exposure of kidneys *in vivo* to radium or roentgen rays likewise destroys the inhibitory factor. Hitherto the observed biological effects of radiation have shown a latent period between the application of the radiation and the manifestation. In these experiments, the change was detected immediately after the exposure was made, and this change appears to be greatest at this time and decreases as time passes. Whether the results bear any relation to what occurs in living tissues or whether they are only a peculiar property of *in vitro* cultivation can be determined only by further investigation.

Cancer may be regarded as a disturbance of the nice balance of growth and the harmony of repair whereby the proper dimensions of the various organs of the body are maintained from birth onward. Nothing is known as to how the various growth rates are controlled or how for instance the skin and the mucous membranes are continually being renewed in a harmoniout manner by the growth and division of cells. It is to be observed that cancer occurs moss commonly in tissues where cell division is continuous throughout life, where, in fact, conditions unfavorable to growth are not strong. Experiment shows that a growth inhibiting factor can be extracted from old tissues which will inhibit *in vitro* growth of young cells. By exposing the skin to radium or roentgen rays

the normal balance is disturbed so that simple overgrowths occur either in the form of warts or malignant epitheliomas. The experiments here described suggest that this is brought about by the destruction of growth inhibiting factors rather than by the production of growth stimulating factors.

MOYNIHAN, BERKELEY. The relationship of radiology and surgery. *Brit. M. J., Lond.*, July 11, 1925, 47–51.

This is an address delivered before the International Congress of Radiology in which the earlier methods of diagnosis in abdominal diseases are compared with modern methods employing roentgenological technique. In cases of gastric ulcer the roentgenologist is on the whole a more competent and more accurate diagnostician than the internist, but there are occasional instances in which the clinical sense affirms the existence of ulcer which is denied by the roentgenologial evidence and which operation shows to exist. In cases of duodenal ulcer the author prefers his own opinion linked with that of the chemist as against that of the roentgenologist. In gall-bladder disease the clinician, if unsupported by the roentgenologist, should be prepared to act alone.

Radiation therapy in various forms of cancer before, during and after operation and in inoperable cases is briefly discussed.

OLLERENSHAW, ROBERT. Congenital defects of the long bones of the lower limb. *J. Bone & Joint Surg.*, July, 1925, vii, 528–552.

Investigation of these congenital defects has brought out many points of interest to the surgeon and the embryologist. These studies show that defects in the extremities may be due to failure in the inherent power of growth of the germinal matter which forms these parts or to mechanical interference from outside. The investigations of the author have led to the conclusion that mechanical interference has nothing to do with deficiency in the long limb bones. The predominant cause is undoubtedly the cessation of growth in one or the other set of embryonal cells in a period between the fourth and sixth weeks of fetal life. The cause of the arrest of growth is quite unknown. Every long bone of the extremities, save the humerus, has at some time or other been reported absent or deficient. The bone most commonly affected is the fibula; then follow in order the tibia, ulna and radius. The femur has very rarely been reported absent or defective.

Detailed reports are given of 2 cases of deficient femur, 2 of congenital absence of the fibula, 3 of absence of the tibia and one of "congenital amputation" through the leg. On the evidence of this series of cases is based the conclusion that the congenital defects of long bones have no connection at all with outside pressure, but are due solely to interference with growth in the limb buds during the first few weeks of fetal life. Deformities associated with defects of the fibula are usually not so severe as in the case of femur and tibia; and it is generally possible to effect improvement by operative and mechanical means. Deformities associated with absence or defect of the tibia are generally very severe and usually amputation alone is possible. Many serious alterations in the muscles are associated with absence of the tibia but they are chiefly such as would be expected under the conditions. There is, however, a strong tendency to persistence and often hypertrophy of a muscle which arises from the fibula and inserts into the same bone. This may be the vestigial tibio-fibular muscle or it may be a very abnormal tibialis posticus. The latter possibility is strengthened by the absence of the tendon of that muscle in the sole. Defects of the femur are usually associated with a normal, or nearly normal lower segment and in these cases operation devised to equalize the length of the two femurs is worth considering.

ALVAREZ, WALTER C. Reverse peristalsis in the bowel, a precursor of vomiting. *J. Am. M. Ass.*, Oct. 3, 1925, lxxxv, 1051–1054.

In contrast to the extended discussions one can find on the part played by the medulla, vagi, esophagus, stomach, etc., in the mechanism of vomiting, very little is to be found as to the part played by the bowel. The regurgitation of intestinal contents into the stomach during or preceding the act of vomiting must be a common occurrence judging from clinical observation.

Records (kymograph) made simultaneously from several regions of the bowels of cats opened under a warm bath of saline, show that vomiting or regurgitation of gastric contents is almost always preceded by an increase in the tone and activity of the small intestine. Actual waves of reverse peristalsis have also been observed and recorded. An increase in the tone and activity of the jejunum beginning 2.5 minutes before the onset of vomiting was recorded graphically in a man with a jejunal fistula. Food inserted through the fistula was vomited.

Depressions which suggest a preliminary inhibition but which may be due only to distention by the oncoming intestinal contents

are observed in some of the records. If we assume that this represents inhibition, then Bayliss and Starling's law can be demonstrated with reverse waves as well as with caudad ones, and it can no longer be assumed to be the cause of normal peristalsis.

BLUE, JAMES A. The advantage of rigid films of various sizes in radiographing the mouth. *Radiology*, October, 1925, v, 346–348.

Realizing that stock films do not adequately meet the requirements in size for properly roentgenographing the mouth, the author has adopted the "Eastman Regular Improved Film" cut in two sizes, one $1\frac{5}{8}$ inches by $\frac{7}{8}$ inches, and (2) $1\frac{5}{8}$ inches by $1\frac{1}{4}$ inches. A thin sheet of metal for stiffening the film is placed between the red and black papers on the back of the film and bound in by passe partout paper.

Film No. 1 is used for roentgenographing the maxillary and mandibular canines and incisors, and No. 2 is used for the maxillary and mandibular premolars and molars. A good plan is to begin roentgenographing at the maxillary left, progressing to the right side, and from the mandibular right to the mandibular left.

In cases where a wider film is desired an Eastman Number 1A film is cut to $1\frac{1}{2}$ inches by $1\frac{5}{8}$ inches. This film is especially useful in roentgenographing the maxillary molars in cases where the vault is very flat, as it permits elongation of the roots sufficiently to eliminate the malar shadows. With the use of rigid films there will occur no distortion if the angles are correct. With care all root apices and contact points can be shown in the average case in fifteen films.

CASE, JAMES T. A minimum standard for *x*-ray service in a hospital. *Radiology*, September, 1925, v, 183–188.

Like the clinical laboratory, the roentgen-ray department is also an essential equipment to every hospital. It is not yet possible to attempt a strict itemizing of the various articles of equipment, for these will vary within certain limits according to the size of the hospital and the activity of the outpatient department. The roentgen laboratory should have the necessary space, be properly lighted and ventilated and conveniently located to the professional services. Proper protection should of course be provided.

The report of the Safety Committee of the American Roentgen Ray Society published in 1923 should be made the basis of considerations in establishing a suitable lay-out. The minimum floor space required by the roentgen-ray department is given as follows: Hospital of 50 beds, at least 400 square feet of floor space; 100 beds, at least 650 square feet of floor space; 150 beds and more, at least 1200 to 3000 square feet of floor space. If the hospital in question is a teaching hospital the minimum requirement is greater.

The roentgen-ray department should be organized and equipped to do roentgenographic and roentgenoscopic work at least. Superficial and deep therapy is advisable where possible and practicable. Plans are presented of roentgenographic installations for the 50 bed and the larger hospital. Brief statements are given of the minimum equipment for hospitals of 50 to 100 beds and for hospitals of 100 beds and up.

It is emphasized that supervision by a medical roentgenologist is essential.

DURHAM, PAUL E. A new reloading needle for the implantation of radium emanation in capillary glass tubes. *Med. J. & Rec., N. Y.*, Nov. 4, 1925, cxxii, 527–529.

A new needle is described and illustrated which has been devised to overcome objectionable features of other implantation needles so far in use. The advantages claimed for this reloading cartridge needle are: (1) uniform and equidistant distribution of seeds; (2) speedy implantation; (3) reduction of trauma; (4) automatic action; (5) no chance of dropping "live seeds" into vital locations while reloading; (6) no hindrance to implantation from fluid in a cavity; (7) less difficult implantation in inaccessible spots; (8) ease of sterilization; (9) protection of the radiologist by the metal parts.

CROWTHER, J. A., and STEPHENSON, R. J. On the effect of capacity on the induction coil. *Brit. J. Radiol.*, April, 1925, xxi, 59–66.

The behavior of a 16-in. induction coil was studied, so far as frequency measurements give any close agreement with the oscillation transformer theory. When a small oil immersed coil was used, the secondary was found effectively non-oscillatory. A simple analysis is sufficient to show that under such circumstances the secondary peak potential should be inversely proportional to the square root of the primary capacity, providing the break is sufficiently sudden. The smaller the capacity therefore, the greater the potential.

The experiments were made on the two coils on open circuit. The nature of the results obtained varied with the primary current employed and with the secondary current produced; that is to say, with the hardness of

the tube. With the much larger currents employed in the primary when the coil is furnishing a secondary current, larger condensers are required to produce a sharp break in the circuit. With the largest currents used a condenser of even 1.2 mf. was insufficient to produce a satisfactory break. It seems probable that with these large currents the break in the primary current by the interrupter is never really sharp. Study of the curves indicates that for all practical purposes the output is almost independent of the capacity of the primary condenser over a very considerable range.

Doub, Howard P., Bolliger, Adolph, and Hartman, F. W. Immediate metabolic disturbances following deep roentgen-ray therapy. II. Prevention and treatment of untoward reactions. *J. Am. M. Ass.*, Oct. 24, 1925, lxxxv, 1299–1303.

In a study of 150 patients treated with a modern deep therapy apparatus including a water cooled tube, a high percentage of acute roentgen sickness was found, especially in those cases treated over the chest, pelvis and abdomen. Determination of the pH of the plasma and of the urine and the use of indicators in the tissues indicate that this condition is associated with a rapidly developing alkalosis and the continuation of this condition after large doses of radiation. This alkalosis is not a result of tissue oxidation but a washing out of carbon dioxide.

After the establishment of the roentgen-ray dose which invariably produces an acute illness in dogs, a test was made of the various agents for counteracting it. Little effect was obtained with hydrochloric acid, ammonium chloride and sodium chloride. Ammonium chloride and hydrochloric acid may combat completely the resultant alkalosis, but the experimentally produced roentgen sickness in dogs was not relieved by these drugs, thus demonstrating the fact that alkalosis is not the only factor concerned in roentgen sickness. Calcium chloride, calcium lactate and morphin were beneficial in preventing or alleviating the symptoms. Morphin invariably prevented the reaction in dogs and was helpful in patients treated over the abdomen, in whom such a treatment was invariably followed by roentgen sickness when unprotected.

The indiscriminate use of roentgen rays (Editorial). *J. Am. M. Ass.*, Aug. 1, 1925, lxxxv, 360.

The New York Academy of Medicine has done a real public service in its recent report on the indiscriminate use of roentgen rays in the treatment of hypertrichosis. The dangers attending the indiscriminate use of roentgen rays need no longer be emphasized to physicians who are very familiar with the distressing character of the symptoms in afflicted patients. The public, on the other hand, has not yet been adequately awakened to the realization that these highly potent rays have potentialities for harm which "beauty specialists" have no occasion to mention, and less skill to avoid.

Hoffman, Frederick L. Radium (mesothorium) necrosis. *J. Am. M. Ass.*, Sept. 26, 1925, lxxxv, 961–965.

An investigation into the subject was suggested by a number of unusual cases of necrosis among young women, all of whom had been employed at a radium plant engaged in the manufacture of luminous watch dials. This report on 12 cases represents the results of a fact-finding process rather than a detailed technical investigation. Interviews were had as nearly as possible with all the interested parties, as well as with attending physicians, dentists, etc. Included in this report is a statement by Dr. Sochoky giving an account of the process and materials involved in the manufacture of luminous dials.

Apparently this form of radium necrosis is unquestionably of occupational origin and should be brought within the plan and scope of the Workmen's Compensation Act for industrial diseases. This necrosis occurs only under certain and quite exceptional conditions. It is not the fact of general exposure to radioactive substances or nearness thereto, but apparently the direct result of introducing such substances in minute quantities into the mouth through the insanitary habit of penciling the point of the brush with the lips. Every case investigated gives an unmistakable history of this habit, and roentgenograms clearly indicate the consequence to both the roots of the teeth and the jaw bone. The mucous membranes of the mouth are apparently resistant to the effects. Radium necrosis resembles phosphorus necrosis very closely, but it should not be difficult for a qualified observer to differentiate them.

Leide, Jakob. Experiments on the problem of the selective action of rays of different wave lengths. *Deutsche med. Wchnschr.*, Nov. 6, li, 1868–1869.

The results of experiments on *Ascaris* ova made by the author are in complete agreement with those obtained by Holthusen, namely, that the younger developmental states (up to

the 4-cell stage) are very sensitive to roentgen rays as compared with more mature embryos. Experiments made with 10 mg. radium bromide gave essentially similar results, thus indicating the physical similarity of the radiations from radium and the roentgen tube. On the other hand, experiments with ultraviolet light showed a gradually increasing sensitiveness as development continued, so that embryos possessing a well-developed differentiation were the ones that possessed also the greatest sensitiveness to these rays.

These results appear therefore to oppose the general view that the different radiations act in an essentially similar manner. It seems, on the contrary, that roentgen and radium rays act in a qualitatively different manner from ultraviolet rays, although we are still in the dark as to the physical and physical-chemical conditions produced. The effects observed with ultraviolet rays constitute an exception to the Bergonié-Tribondeau law.

KUHLMANN, B. The general action of roentgen rays. *Strahlentherapie*, 1925, xix, 817–881.

The author presents a critical review of the literature covering some 200 references from the recent world literature on the effects of roentgen rays. The summary is as follows:

It should be recognized that practically all portions of the living body react in one form or another to the action of roentgen energy. This reaction of the body can be definitely demonstrated by suitable methods of study. Moreover, the numerous purely clinical observations have established the fact that the human organism undergoes numerous changes in its various parts as a result of roentgen irradiation.

Many different methods of investigation have demonstrated that tissue fluids, as well as the blood, with their extraordinarily variable products of metabolism undergo pronounced changes upon absorption of roentgen energy. The microscopic picture likewise has revealed the reactions of the different tissues in numerous experiments. A consideration of all these results brings forth the following two questions: (1) How do all these changes take place, and is it possible for us to refer all the various changes produced by roentgen rays in the organism to one primary factor, and (2) should one regard the therapeutic end result of irradiation largely as a local process or does the general reaction play a considerable or perhaps the main rôle in the evolution of the end result?

Meyers and Holthusen assume the primary effect to be an injury of the body cell which initiates the liberation of decomposition products of protein and lipoids that affect the autonomic nervous system. All the other observed changes, especially that of the mineral metabolism, follow this action on the nervous system. Kroetz assumes the primary effect to be a breakdown of cell protein and inflow into the serum of strongly acid protein decomposition products. This corresponds to the observed primary temporary acidosis and the period of maximum increase of the anion deficit. All these changes in the blood composition are readjustments in the process of regulation of the reaction, or are secondary results on fluids internal or external to the cells of the body caused by radiations according to physical laws. The behavior of the respiratory center is an indicator and measure of the degree of cell juice modification and of the changes in the environment of the cells. That is, etiologically, the explanation of the general effect is to be found in the primary action upon the cell.

The answer to the second question is much more difficult. A definite answer cannot be given because the investigations up to now have been insufficient.

PEARCE, LOUISE, and VAN ALLEN, C. M. Effect of controlled conditions of illumination upon malignancy of transplantable neoplasm. *Proc. Soc. Exper. Biol. & Med., N. Y.*, May, 1925, xxii, 448–452.

In the case of the transplantable neoplasm of the rabbit it has been found that periods of maximum and minimum sunlight corresponding with summer and winter are periods of relatively low malignancy; while the periods of greatest malignancy occur at times of abrupt and rapid changes in the hours of sunshine corresponding roughly with spring and fall. In order to test the relationship between sunlight and the physical state and functional activities of the animal, experiments were undertaken in which conditions of illumination could be controlled. The particular points studied were the effects induced by a constant illumination of maximum intensity practicable with simple equipment and a constant absence of illumination for stated periods of time upon the normal rabbit and upon the course of the disease produced by the malignant tumor. These conditions were controlled in each instance by parallel series of rabbits kept in an ordinary animal room.

The malignancy of the disease in the control group was on a comparatively high level. The primary tumor grew rapidly and extensively during the first three weeks and then usually regressed. The animal incidence of metastases

as found at autopsy was 56 per cent and there was a total of 73 metastatic foci in 5 animals, while no metastases were found in 4 others.

A definitely less malignant disease developed in the rabbits in the dark room. The group almost immediately became divided and these were the animals which succumbed to the disease three and one-half and four weeks after inoculation. In 7 animals the primary tumor grew more slowly and ultimately regressed. In 4 rabbits seven metastases were found clinically, while the mortality rate of the group was 30 per cent. The animal incidence of metastases was 40 per cent with a total of 65 foci of secondary growths in 4 animals and none in six.

In the light room, however, the malignancy of the disease dropped to a very low level. The initial growth of the primary tumor in the majority of the animals was unusually rapid and extensive, but in 9 rabbits it eventually became entirely necrotic or was completely healed. In addition six metastases were found clinically in only 2 animals. The mortality rate was only 10 per cent as contrasted with 30 per cent in the dark, and 56 per cent in the control groups. Post mortem examination showed twenty-four metastases in 5 animals and none in 5 more. It is certain that none of the surviving rabbits would have died from the effects of the tumor.

It is evident that the establishment of practically constant darkness produced a slight but definite influence upon the course and malignancy of this tumor so that those animals which possessed a high resistance either natural or acquired were enabled to exercise this effect more efficaciously. Such an influence was not sufficient to enable less resistant animals to cope successfully with the disease. On the other hand, with the conditions of constant light even without the short ultraviolet rays, the disease assumed an extremely mild form, only one animal in the group dying from its effects and this occurred later than the 3 deaths in the dark group or the 4 among the controls. It would appear, therefore, that in this environment of artificial light a restraining or inhibitory action upon this disease was developed.

Pohle, Ernst A. Studies on the suspension stability of the human blood. 1. The velocity of the sedimentation of erythrocytes in *x*-ray therapy cases. *Radiology*, September, 1925, v, 206–210.

The rate of sedimentation of erythrocytes is taken as an index of the suspension stability of the blood which is associated with the colloidal composition. The sedimentation test is briefly described.

It is reported that exposure to roentgen rays causes certain changes in the suspension stability of the plasma as made evident by marked variations in the sedimentation test. This confirms the observations of other authors.

In cases receiving small doses of roentgen rays the sedimentation rate is apparently unaffected to any striking extent. In cases receiving doses of medium size (sterilization, fibroids, Hodgkin's disease, etc.) there was a retardation of the rate of sedimentation lasting from three to ten hours, when there is a reversal, and acceleration occurs with a return to normal as the patient recovers. In groups receiving large doses of roentgen rays the curve of sedimentation is a continuation of that found in the second group.

Poole, H. H. A mechanical device for sealing off radium emanation tubes. *Sci. Proc. Royal Dublin Soc.*, August, 1924, xvii, 337–339.

The problem which has presented the greatest difficulty in the Irish Radium Institute is that of the protection of the operator's fingers during the division, by sealing off, of the long capillary tube, containing the emanation, into pieces, each about 1.5 cm. long, suitable for insertion in serum needles. The process involves the simultaneous rotation and drawing out of the tube. It is difficult to ensure satisfactory results if the parts to be separated are held with forceps, and the usual practice has hitherto been to hold the tube with the bare fingers and trust to speedy work. An apparatus has been constructed to obviate all handling of the tubes during the sealing off. It has been in continuous use for some weeks and works well. The device may be described as a crude form of miniature lathe, with two collinear chucks, in which the capillary tube may be held, and rotated independently at the same speed. Each chuck is allowed about 3 mm. end play in its bearings so that the space between them may be anything between 7.5 mm. and 13.5 mm. A swinging frame is suspended from the end of the fixed cantilever, and carries a small gas jet, the position of which can be readily adjusted. An emanation capillary can be easily slipped through the center of the chuck when the head is unscrewed, and when the latter is screwed up the capillary is firmly gripped by a rubber holder. The ink spot marking the point where a seal is desired is placed so as to be midway between the chucks. The chucks, which are geared up in the ratio of 3 to 1 are rotated at about 400 r.p.m. The gas flame is then applied to the desired point on the capillary which is very quickly drawn out and sealed off.

RAHM, HANS. Roentgen spectrography. *Beitr. z. klin. Chir.*, 1925, CXXXIV, 209–229.

An exposition is given of the physical fundamentals underlying the measurement of wave length and intensity of roentgen rays, and of their use in medical practice. The Seemann spectrograph is described and its use illustrated. Numerous spectrograms are pictured and their interpretation given. Illustrations are given of the method of studying roentgen-ray output by means of the spectrograph. It is pointed out that the so-called calibration curves of the kilovoltmeter should in all cases be tested spectrographically and not at the factory but in the place where the roentgen installation is located, and under the actual conditions of operation. It is claimed that the addition of condensers is not always an improvement in the operation of roentgen machines.

From the standpoint of uniformity it would be of advantage to determine the maximum tube voltage in terms of λ_0.

SCHERESCHEWSKY, J. W. Cancer mortality in the ten original registration states; trend for the period 1900–1920. *J. Am. M. Ass.*, Oct. 17, 1925, lxxxv, 1175–1180.

There has been a pronounced increase in the observed death rate from cancer in persons forty years and over in the ten original registration states of the United States. Part of this increase (about 30 per cent) is due to greater precision and accuracy in the filling out of death returns. The remainder, however, is an actual increase in the mortality resulting in a death rate between 25 and 30 per cent higher than it was twenty-one years ago.

Since this increase is here we must look to factors in our complex civilization which have brought about this great increase in cancer mortality. This means a greater concentration in exploring the etiology of cancer. This increase in cancer mortality will probably not continue indefinitely. Like all biologic phenomena these processes tend to reach a state of equilibrium sooner or later.

WOOD, FRANCIS C. Further studies in the effectiveness of different wave lengths of radiation. *Radiology*, September, 1925, v, 199–205.

Previous experiments on the effects of two different wave lengths of roentgen rays on standard animal tumors had shown that with equal ionization dosage, as measured by the Duane type of chamber, the tumors were killed at approximately the same time. These experiments have now been extended to another type of tumor, with the same result. The new tumor experimented with is known as Rat No. 10 tumor and is an actively growing spindle cell sarcoma of high inoculability and considerable resistance to roentgen rays. The radiations used were (1) 0.6 Å, and (2) 0.2 Å.

Taking into account the previous experiments with the Flexner-Jobling rat carcinoma and the Crocker Fund No. 180 mouse sarcoma, there are three different types of tumor in which the death point differs with each but the death point with different wave lengths, for all practical purposes corresponds. Exactly similar curves are given with radium.

No two tumor cells have exactly the same resistance to roentgen rays. Some are killed easily and some with difficulty. There is little or no difference between the action of short and long roentgen rays within the limits of ordinary practice when the quantities are measured by an open ionization chamber. Consequently if different wave lengths do not differ in their effectiveness one can select whatever wave length is most suitable in regard to the depth of tissue that must be penetrated to reach the tumor. The above observations render it improbable that there is a special selective ratio between tumors and normal tissues at some specific wave length. The two important variables that remain are organ susceptibility and tumor resistance.

WILSEY, R. B. The laws of development of *x*-ray films. *Radiology*, September, 1925, v, 237–244.

It is universally agreed among roentgenologists that the making of a roentgenogram is a simple matter compared to the skill, training and experience required for its interpretation, yet there is no reason why the technical requirements for making a good roentgenogram should be neglected. The importance of care and cleanliness in all photographic operations cannot be overemphasized.

A study was made of the progress of the development of roentgen-ray films under definite conditions of exposure and subsequent development. The density of the film grows continuously with the time of development. Contrast grows for a while, reaches a maximum and then diminishes, owing to the veiling effect of fog on the lower densities. These and other characteristics are accurately shown by means of graphs. The same curves can be obtained by keeping the time of exposure constant and varying the intensity of the roentgen rays to produce the successive densities.

A broad range of developing time can be employed without altering the contrast of the roentgen film appreciably. A safe rule would be to keep the development within a range in which the contrast does not vary more than 10 per cent from the maximum. The exposure must be controlled so that the proper density may be developed within this range of time. Any development outside this range of time will result in a noticeable loss in the quality of the roentgenogram. The emulsion fog and developer fog must both be kept low in order to obtain the best contrast and latitude in exposure and development. Taking eveything into consideration it is best to try to control exposures so that the standard time of five minutes for development in fresh solution at 65°F. can be maintained. If the exposure is not judged correctly four to eight or nine minutes of development will usually give negatives of practically equal quality when developed to the same density.

Experiments in the exhaustion of developer have shown that even after considerable use, the solution will give a good quality of roentgenogram provided the time of development is sufficiently increased. It is, however, not possible to give any general rule for estimating the degree of exhaustion of a developer. A determination of the Watkins factor will give this information very readily. This method of testing the developer also indicates when it should be renewed. When the standard time of development has increased to eight or ten minutes economy of time would require that the developer be replaced with fresh solution.

Hot weather adds considerably to the difficulties of development. The principal troubles are due to swelling and softening of the gelatin. The best remedy is to cool the solutions artificially to 65°F.

ANCEL, P., and VINTEMBERGER, P. Influence of the rapidity of development of the irradiated egg of *Rana* on the duration of its survival. *Compt. rend. Soc. de biol.*, Par., 1925, xciii, 281–283.

Eggs of *Rana* when irradiated with 12 H or 7 H, when receiving the same dosage, died at the same stage whether they were developed at 19° or 8°C., but they were not killed at the same time after irradiation. When a dose of 3 H was given, the great majority of eggs were killed in the course of gastrulation; two days after when developed at 19°C. and six days later if developed at 8°C. When an egg has received a fatal dose of the roentgen ray, there is a direct relation between time of survival and rapidity of development, a longer survival accompanying decreased activity. The gravity of the lesion caused by the roentgen ray is determined by the dose of the ray and the sensibility of the egg. The manifestation of the lesion is shown by the process of development of the egg after irradiation.

ANCEL, P., and VINTEMBERGER, P. A comparison between the effects of the roentgen ray and aging on the egg of the hen. *Compt. rend. Soc. de biol., Par.*, 1925, xcii, 1401–1403.

The evolution of the egg of the hen when irradiated with the roentgen ray is exactly the same as that of old eggs. Judged by the effects obtained, it appears that irradiation with the roentgen ray causes transformations quickly which take place slowly in the eggs which are aged naturally. The changes in the embryo in the eggs are criteria on which these conclusions are based.

ANONYMOUS. Bibliography of the normal chest. *Tubercle, Lond.*, May, 1925, vi, 386–391.

A compilation is presented of twelve monographs covering the anatomy and physiology of the normal chest. In addition there is presented a list of recent articles on the anatomy, development, physical signs, physiology and respiration, vital capacity and roentgenology of the normal chest. The roentgenological section covers twenty-two references.

BARDACHZI, FRANZ, and MACZAK-OTTENBURG, HUGO. The use of the Lilienfeld tube in roentgenography. *Med. Klinik*, Feb. 27, 1925, xxi, 320–321.

It is the impression of the authors that the advantage of the Lilienfeld tube over the Coolidge tube lies in the fact that the independent regulation of ray hardness and intensity during use is more certain in the former. A table is presented showing the time in milliampere-seconds necessary for the proper exposure of the various portions of the body usually subjected to roentgenographic study.

BLUMER, L. The radioactive effects of various muds. *Schweizer. med. Wchnschr.*, June 18, 1925, lv, 579–582.

(The title of this paper is somewhat misleading as "various muds" are not mentioned.)

A mixture was made of 7 kilos of garden soil with 500 gm. mesothorium mud, corresponding to an equivalent of 0.07 mg. radium element. In this mixture were planted some white

radishes. A control experiment was made in ordinary garden soil. After two months the radishes in the radioactive soil were much retarded in growth as compared with the normal. The radishes obtained from the radioactive soil possessed an insignificant radioactivity. The radish tops were somewhat more radioactive.

Another experiment was performed using the rabbit. In this the mesothorium powder was placed on one ear and covered over with adhesive, the other ear being maintained as a control. In another rabbit the mesothorium powder was mixed with water and applied as a compress to the shaven abdominal region for eight days. There was lifting of the stratum corneum, edema of the papillary zone, with some infiltration. These few experiments indicate that it is possible to produce biological effects with radioactive materials of low activity.

COOLIDGE, W. D. High voltage cathode rays outside the generating tube. *Science*, Nov. 13, 1925, lxii, 441–442.

With a specially designed hot cathode, high vacuum tube containing an aluminum window 8 cm. in diameter, it has been found possible to operate with as much as 200 kv. and several milliamperes. Electrons are ejected into the air in front of the window to a distance proportional to the voltage applied. The lowest peak voltage at which there is appreciable intensity in front of and close to the window is 70 kv., and the maximum range at the highest voltage used, 250 kv., is 46 cm.

The effect of these electrons on organized tissues is very pronounced. The ear of a rabbit was rayed over a circular area 1 cm. in diameter with 0.1 ma. for 0.1 sec. Within a few days the rayed skin became deeply pigmented and the hair came out. It was not until seven weeks after the treatment that new hair appeared.

A second similar area was rayed with 1 ma. for 1 sec. After several days a scab formed over the area and a few days later the scab came off taking the hair with it. Two weeks later a profuse growth of snow white hair started which soon became much longer than the original grayish hair.

A third area on the ear was rayed with 1 ma. for 50 sec. In this case a scab developed on both sides of the ear and the scabs later fell out leaving a hole in the ear. The periphery of this hole was at first devoid of hair but is now covered with a growth of snow white hair.

Fruit flies, upon being irradiated for a small fraction of a second with 1 ma. instantly showed almost complete collapse and in a few hours were dead. Bacteria have been irradiated and an exposure of 0.1 sec. has been found sufficient to kill even the highly resistant spores of *B. subtilis*.

CREVOISIER, P. Attempt at prophylactic treatment of roentgen sickness. *Schweizer. med. Wchnschr.*, May 14, 1925, lv, 434–440.

It is the author's belief that the symptomatology during menopause is not that of a sympathicotonia but rather predominantly one of vagotonia; and undoubtedly the roentgen sickness following roentgen therapy during the menopause is an aggravation of this condition. In order to test this the author has made a pharmacological examination of the vegetative nervous system by subcutaneous injections of adrenalin, atropin and pilocarpin, twenty-four hours apart, and measuring after each injection the pulse rate, blood pressure and the concomitant symptoms. The hypertension of menopause was made evident: Complete hypertension (maxima and minima both above the average) with a pronounced elevation of the minimal tension. This is entirely due to the increase in peripheral vascular resistance. An analysis of the curves obtained all seem to indicate a predominant vagotonia during menopause.

As a result of these observations it would appear logical to seek to re-establish the equilibrium by some positively acting drug. The procedure followed, therefore, was to give a rectal administration fifteen minutes before application of irradiations (which lasted 2 to 2.5 hours) 20 drops of a solution of 1 per cent adrenalin in 12 to 20 c.c. of saline, containing 5 drops of tincture of opium. During 1924, 50 cases have been subjected to this prophylactic treatment without a single bad effect. Most of the patients were released on the day of treatment or the next day. They were able to take ordinary nourishment immediately after irradiation without any ill effects.

It seems justifiable to conclude from these observations that roentgen sickness is the result of an irritation of the parasympathetic system. It is probably incorrect to assume a direct action of the rays as the cause of the reactions following irradiation. The reaction is induced through the vegetative nervous system. Just as "essential" hypertension appears to be due to a predominance of parasympathetic action over sympathetic, it seems reasonable to consider the hypertension and other symptoms of menopause the result likewise of a disequilibrium created by the predominance of parasympathetic action, and

not as due to sympathicotonia. The disequilibrium caused by this pre-existing vagotonia added to the vagotonia caused by the deep irradiations can perhaps be effectively counteracted by adrenalin (excitation of the sympathetics), but apparently not by atropin (paralysis of the vagus).

CUNHA, JUAN. Radiologic considerations of gastro-duodenal anatomy and physiology. *Radiology*, December, 1925, v, 459–467.

Since the beginning of gastric roentgenology a great many indirect signs have been described. All are based upon the anatomy and physiology of the stomach and duodenum; and only through an exact knowledge of the physiology can one put a proper interpretation and evaluation upon them.

The dome of the stomach is maintained always high and distended by its intimate contact with the diaphragm, and the two are held united by the physical laws of pressure equilibrium which explain the formation of the air pocket. The form of the gastric dome depends upon the form and condition of the diaphragm and of the splenic flexure of the colon. When one examines the stomach one must also examine the thorax, the diaphragm and its degree of mobility, the condition of the pleural sac, and the left colonic flexure. The normal form of the stomach, roentgenologically speaking, is that of a "J" hung by its ends from the cupola of the diaphragm and from the duodenal angle.

The problem of motility and emptying of the stomach may be outlined as follows: The stomach is a muscular organ and every muscle acts under the excitation of its nerves. Various agents may excite these nerves. Consequently all agents which stimulate gastric nerves or plexuses have an action on the musculature, and therefore on motility and emptying. The motility and the emptying of the stomach depend upon many agents and upon many circumstances of the moment and of the individual. It is absurd to reduce these factors to one single formula and attribute to a single agent, the HCl, the entire control of pyloric opening and closure.

Nature has given the entire digestive tube two distinct muscular coats, and the progression of bowel contents is always due to a synchronizing of the contraction of the two coats. The contractions provoked in these coats of muscular fibers by the many agents stimulating the digestive sympathetic system are independent in the stomach and synchronize at the moment of emptying. They always travel together and are always synchronous in the small intestine. They are once more independent in the large intestine and only at certain moments do they combine and synchronize to produce great progression of bowel content or its evacuation. This represents the author's conception of the neuro-motor physiology of the gastrointestinal tract.

DODDS, EDWARD CHARLES; LAWSON, WILFRED; and MOTTRAM, JAMES CECIL. Some metabolic differences, following *x*-radiation, between normal rats and rats immune to Jensen's rat sarcoma. *Biochem. J., Lond.*, 1925, xix, 750–752.

No difference in metabolism has hitherto been described between normal rats and animals immune to Jensen's rat sarcoma. Experiments were made in which an erythema dose was given, the spark gap being 18 cm. and filter 0.1 mm. Al plus 3 mm. wood. Observations show that there must be some peculiarity in the metabolism of the "immune" animals, since an exposure to roentgen rays causes an immediate fall in the blood urea content from a normal value of about 35 mg. per 100 c.c. to about 14 mg. per 100 c.c. This reaction to roentgen rays appears to be a permanent property of "immune" animals.

At the present stage it would be unwise to offer any explanation of these results, but it is hoped to extend the observations to animals rendered immune by artificial means.

DORLAND, W. A. NEWMAN, and HUBENY, M. J. Diagnostic and therapeutic *x*-radiation in pregnancy. *Illinois M. J.*, May, 1925, xlvii, 362–365.

The authors emphasize their belief that when used for the short time that is necessary to obtain a diagnostic plate, especially if the exposures be made at suitable time intervals, there is no danger of unpleasant or disastrous sequelae to either mother or child from the use of roentgen rays for diagnosis. They are, however, not ready to accept unqualifiedly the statement that newborn babes show complete immunity to ordinary roentgen-ray exposure. This is still an unsettled question.

To obtain good diagnostic plates there is required an exposure of but four seconds using a spark gap of 4 to 6 inches, with double screen and superspeed films.

No more positive sign of pregnancy can be adduced than visualization of portions of the fetal skeleton. Theoretically the fetal ossification centers should appear on roentgenograms made at about two months of pregnancy. Clinically, however, this is not possible because there are certain factors which prevent the

necessary clearness of detail. These factors are the varying thickness of the maternal walls; the quantity of amniotic fluid; the pelvic position of the uterus; the cartilaginous formation of the fetal bones and the occurrence of fetal movements which would naturally result in indistinctness, distortion and possible duplication of the fetal bones, thereby complicating the diagnosis. By the use of the Potter-Bucky diaphragm and improvement in the delicacy of technique, it has become possible to recognize fetal bony structures, notably the head and spinal column at from 3.5 to 4.5 months. The diagnosis has been facilitated in certain instances by the use of artificial pneumoperitoneum.

Absence of traces of fetal bones in supposed cases of pregnancy of six months or more would be a strong negative sign of pregnancy and a reasonable indication of fibroma or myoma.

When roentgen rays are used whether as a hemostatic or for the purpose of castration, there certainly exists imminent possibility of danger to the child should pregnancy exist at the time or shortly after the therapeutic application. The possible danger is four-fold. (1) Will the rays cause a temporary or permanent sterility of the woman from the destruction of the germinal elements of the ovary? (2) Will the follicles, if not destroyed, be so injured or altered as to result in the development of abnormal offspring? (3) Will the growing embryo be so damaged as to result in embryonic death and early abortion? (4) Will the fetus, apparently normal at birth, show defects in post-natal development; or if the irradiation has occurred in late pregnancy, will it show disturbance in metabolism later in life? These are the obstetric and fetal possibilities which only the accumulation of large numbers of clinical reports can finally determine. Case reports found in the literature support some of these notions.

Dognon, A. Coefficient of temperature of the action of the roentgen ray on the eggs of *Ascaris*. *Compt. rend. Soc. de biol., Par.*, 1925, xcii, 1389–1392.

The action of the roentgen ray on the eggs of *Ascaris megalocephala* at various temperatures gave the following results: The action of the rays is multiplied about 2.6 times by an increase in temperature of 20°C. at the temperatures studied. The coefficient is somewhat lower with eggs irradiated dry, when the activity of the life processes is greatly diminished. When the temperature exceeds 35°C., the coefficient diminishes. The sensibility of the eggs in a state of anaerobiosis, in which the activity is very weak, is greatly diminished. The sensibility of the eggs in the dry state is very inferior to the same eggs irradiated when moist. The coefficient of temperature diminishes when temperatures above optimum are used.

Dott, Norman M., and Bailey, Percival. A consideration of the hypophysial adenomata. *Brit. J. Surg.*, October, 1925, xiii, 314–366.

In a prefatory note Harvey Cushing points out that we know nothing of the underlying causes of pituitary adenomas so that prevention is beyond our grasp, but we are at present encouraged to believe that certain of them are amenable to radiation. This, however, as seems to be true of the thyroid adenomas, may prove a disappointment; and that accidents may occur from too vigorous irradiation is indicated by the experience in one of the cases described by the authors.

A clinico-pathological study of 162 examples of pituitary adenoma shows that three fairly definite types of tumor can be recognized histologically, and that they represent more or less definite clinical syndromes. The syndrome of acromegaly corresponds with the chromophil adenoma; that of hypopituitarism with a chromophobe adenoma; and the mixed syndrome with a mixed type of adenoma. Case histories are given to illustrate these several syndromes. Though our knowledge of the physiological action of the pars distalis is in its infancy, it may be asserted not only that it exerts an influence on growth but that the eosinophile cells are the ones generally concerned. In the absence of an increase in the number of these cells, evidences of overgrowth of one sort or another have not been found to occur. We have as yet no knowledge of the biochemical influences which underlie the formation of these adenomas and can only draw analogies from the better known lesions of the thyroid in arriving at interpretations. The treatment of these lesions is therefore still at the primitive stage in which a radical operative measure rather than some simpler agent is called upon to relieve the effects of local pressure on important neighboring structures.

The recognition of a tumor of the hypophysial region presents little difficulty, as a rule. The primary optic atrophy, characteristic visual field defects, the ocular palsies, the roentgen-ray picture of sellar deformity leave little room for doubt. Congenital craniopharyngeal pouch tumors show in 85 per cent of the cases a definite typical shadow in the roent-

genogram by reason of calcium deposits. In gliomas of the optic nerve or chiasm the field defects are atypical and a localized erosion of one or both clinoid processes, as disclosed by the roentgenogram, may aid in the differential diagnosis.

The authors advocate for the treatment of hypophysial adenomas a trial of roentgen therapy unless there is imminent danger of loss of vision, when a sellar decompression should be done forthwith. During the course of the roentgen treatment, the progress of events should be carefully controlled by repeated perimetric examinations. The roentgen treatments should at first be administered at intervals of three of four weeks, and later treatments should be adjusted as the circumstances of the case demand. The rays are directed to the pituitary fossa through three portals of entry. Areas 3.5 inches square over each temporal bone and occasionally a similar frontal area are used for this purpose. A maximum skin dose is delivered at each sitting, the factors for the ordinary 10 or 12 inch roentgen-ray machine being 9 to 10 inch spark gap, 80 to 100 kv., 12 inch skin target distance, 0.25 mm. Cu plus one thickness of sole leather, 30 min., 5 ma., 2 or 3 treatments may be given through separate portals at one sitting with but slight immediate reaction. Treatment through one area is not repeated at an interval of less than three weeks.

Emile-Weil, P. Leucemia from radioactive bodies. *Presse méd., Par.*, 1925, No 78, 1297–1299.

Leucemia as a result of the action of radioactive bodies has not been generally reported in the literature. Eight cases are reviewed, 6 cases caused by the roentgen ray, one by radium and one by thorium, all of which have been known to produce pernicious anemia. In all of these cases the irradiations were given in small, repeated doses. The fact is established that cases of leucemia may be due to the action of penetrating rays of short wave length. The author gives detailed case reports of 3 such cases. One case was that of a man who worked with radioactive substances, radium and thorium, over a period of years and who died with clinical symptoms of leucemia, substantiated by findings in the blood and autopsy examination. The blood-forming organs showed marked changes; the testicles were also greatly affected, being completely sterilized. Another case was that of a radiologist who did not give the proper attention to protection against the roentgen ray, and as a consequence suffered severe lymphatic leucemia. The third case was that of a woman who had been given a rather intense treatment, prolonged seven hours, of roentgenotherapy for uterine fibroma. The doses used are not known. The patient suffered from feebleness, vomiting and abdominal pains afterwards. Examination of the blood showed marked leucemia. The patient died; the autopsy findings were those of classical leucemia.

Fenwick, P. C. Devices for the use of radium in gynaecology. *New Zealand M. J.*, August, 1925, xxiv, 195–196.

A vaginal applicator is pictured which is made of a hollow vulcanite tube passed through and fixed to an oval vulcanite shield. The tube is 9 cm. long of which 6 cm. projects through one side of the shield. The internal diameter of the tube is 15 mm. The radium needle shielded with 2 mm. of lead is placed in the tube and the opening blocked with cork or wool and the tube is then inserted into the vagina, the shield being pressed to the vulva with a pad of wool and a T bandage. This device should prove useful also in the treatment of pruritus and hemorrhoids.

A vaginal applicator for cancer of the cervix is made by joining together two hollow lead tubes (internal diameter 6 mm.) to form a horse shoe. The radium element is placed in each arm of the horse shoe, the open ends are blocked with lead and the whole applicator is covered with 2 mm. of rubber tubing. The applicator is then introduced sidewise and turned so as to embrace the cervix.

A rubber bag for use in the vagina is made from a rubber glove. The fingers and thumb are tied with silk at their roots and the glove is turned inside out. The wrist is pleated around a rubber drainage tube and tied with silk. To distend the bag a small rubber syringe or Higginson syringe is attached to the tube. To withdraw the bag it is only necessary to allow the air to escape.

Küstner, Heinz. Studies on the endocrine changes following uterus extirpation, surgical castration, roentgen castration, and the normal climacterium. *Monatschr. f. Geburtsh. u. Gynaek., Berl.*, September, 1925, lxx, 284–289.

A modified Abderhalden test was applied whereby pathological change of the internal secretion of the ovaries was detected. The test was applied to 9 women after conclusion of the normal climacterium; in 21 women with uterus extirpated before occurrence of climacterium; in 13 women with uterus and ovaries extirpated before the climacterium, and in 23

women castrated with roentgen rays before the climacterium. In all of the groups but the last, the test was practically uniformly negative, which is interpreted as meaning absence of abnormality in the internal secretion of the ovary. On the other hand, the serums of the roentgen castrated women were definitely positive.

The following interpretation is made: When the ovary approaches the end of its function during the middle of the fourth decade, the gland becomes no longer essential to the organism as a whole. As a consequence the blood serum does not undergo any change during this period. When the uterus is removed in a woman before the climacterium, the ovaries remain unaffected in function, especially as regards the internal secretion. When both ovaries are removed surgically from a woman before the climacterium the serum gives no reaction with ovarian substance. On the other hand, women castrated by roentgen rays show a very pronounced pathological alteration in the serum. The irradiation brings the follicular apparatus to rest, but as a result of this there probably occurs change in the endocrine portion of the gland. Although such changes have not been demonstrated pathologically-anatomically in irradiated ovaries, these serological tests compel such an interpretation.

Consequently one should not speak of a mere roentgen castration, but rather of roentgen irradiation inducing ovarian change causing a condition in the patient approaching the domains of pathology, if not actually trespassing them. Not only is the normal function of the ovary inhibited but a new pathological function is superposed. It is therefore recommended that the indications for roentgen irradiation of the ovaries be carefully scrutinized and uterus extirpations be performed wherever there are no contra-indications to the surgical procedure.

KOMURO, HIDEO. The effect of hard and soft roentgen rays on the seed and young plants of *Vicia faba* and the roentgen tumor formed in the tissue of the root tip of these plants. *Ztschr. f. Krebsforsch.*, 1925, lxii, 199–209.

Soft rays produce a much greater effect both physiologically and cytologically than do hard rays. The course of cytological changes induced by soft rays appears to be more or less different from those caused by hard rays. In young plants, hard radiation induces cytological changes within a few hours, whereas soft rays show their effect almost immediately. Distinct nodules or foci appear after soft irradiation of seeds that have been kept moistened for several hours. A two-hour irradiation induces such a change in twelve to fourteen days after a second such treatment. There exists a distinct difference in the cytological changes in the root tips of seedlings grown from seed irradiated while in an air dried condition; and soft rays bring about these changes much more prominently than do the hard rays. Interrupted irradiation which produces a stronger physiological effect also shows more distinct cytological changes than continuous irradiation. A striking phenomenon observed in the plant tumors is the fact that the vascular bundles always approach the nodules or occasionally distribute themselves around the nodules.

GRILLON, PH. Presentation of a new generator constructed by R. Casel for medical roentgenology. *Bull. et mém. Soc. de radiol. méd. de France, Par.*, 1925, xiii, 52–55.

A detailed description and pictures of a new generator are given. One of them giving a voltage of 300,000 volts is designed especially for deep roentgenotherapy. The other is designed to give a maximum of 120,000 volts.

KOTZAREFF, A. Blood changes in rabbits and guinea pigs produced by local or intravenous injections of radium emanation. *Schweizer. med. Wchnschr.*, June 4, 1925, lv, 537–539.

There was no important change in the formed elements of the blood following injection of radium into the heart of the rabbit. Slight decrease in erythrocytes and hemoglobin was due to repeated blood withdrawals. This was checked in the control animal. The slight changes in number of white cells and in the leucocytic proportions were probably also due to the effects of puncture. There occurs a disequilibrium in the colloidal state of the serum following an injection. This alteration lasts about twelve days in rabbits not further injected. In fact, a control animal receiving an injection of serum showed more pronounced hematological changes than did the animal receiving the injection of emanation. The experiments indicate that the introduction of radium emanation into the circulation, even in a fairly big dose for the rabbit (16.5 mc. maximum) does not produce a severe lesion in the animal. There occurs no important modification in the formed elements of the blood. The blood serum appears to be changed in its electro-colloidal state and appears to contain new substances; or at least, it undergoes quantitative change among its components (especially those due to protein decomposition, albumose, peptones, amino acids, etc.). This

change, however, lasts about seven to twelve days and then there is a return to the normal.

Local intramuscular injection of radium emanation produces the same effects. On the other hand, the local application causes local destruction of the normal tissue and death of the rabbit in three months. The products of the destroyed cells circulate in the body and produce a toxic effect. In other words, alterations occur locally resulting in radiodermatitis, hyperplasia, and papilloma, together with serological changes and general blood changes.

It may be concluded that injections of radiocolloidal substances are without danger for the organism in general, particularly cancerous blood. There seems to be a selective fixation of radium emanation in embryonic and neoplastic cells.

KOTZAREFF, A. Apropos the note of A. Lacassagne and J. Lattès on the fixation of polonium by the organism and on the autoradiography of the organs. *Compt. rend. Soc. de biol., Par.*, 1925, xciii, 404–405.

The author calls attention to the fact that he was the first to use radium and polonium in what he has termed *curiegraphy*. He claims that Lacassagne and Lattès have "rediscovered" this use of polonium in what they call "*autoradiography*." Kotzareff used radium in various solutions and was able to make plates direct from various organs after autopsy and also in the living subject. He also used a small proportion of polonium, but placed most reliance in the radium. On the other hand, Lacassagne and Lattès used polonium alone and were able to obtain photographic plates of organs after autopsy only. Polonium emits only α rays, which are more readily absorbable and are arrested by the layers of living tissues. On the contrary, radium emits the β and γ rays also, which are more penetrating than the α rays. The author used radium very successfully in the living subject and obtained equally good results in the organs after autopsy. He antedated the work of Lacassagne and Lattès by three years, and to him the credit for this method of photographing organs must naturally belong.

LACASSAGNE, A. Apropos the roentgenography of organs by means of radioactive substances introduced internally. Reply to M. Kotzareff. *Compt. rend. Soc. de biol.*, 1925, xciii, 514–515.

The author defends himself against the accusations of Kotzareff and states that he did not claim to have discovered the use of radioactive substances in roentgenography. In his previous papers he gave credit to other authors who had made use of this process before even Kotzareff. He dismisses all claims to originality in the matter.

MAYER, ERNST G. General roentgenological progress and its application to diagnosis and therapy in ophthalmology. *Klin. Monatsbl. f. Augenh.*, May–June, 1925, lxxiv, 612–622.

In therapy, as well as in examination, it has been found that no case is exactly like any other and that general rules apply only up to a certain point beyond which a case should be conducted individually. Slight changes in the roentgen picture, the cause of which is not clear, should not be ignored, but an attempt should be made to explain their occurrence, for frequently one discovers that such a neglected detail may constitute the deciding point in the correct diagnosis of the case. An incomplete roentgenological examination is not only unsatisfactory but is often worse than the omission of the whole roentgen examination because the incomplete study may be misleading.

Some of the general aspects of roentgenology in relation to ophthalmology at the Central Roentgen Institute in Vienna are briefly discussed. The most frequent indication for roentgen examination of the eye regions is concerned with metallic foreign bodies. This examination is relatively easy, except in a rare case where the foreign body is hidden behind the shadow of some dense bone structure. Careful analysis, however, is necessary because frequently foreign bodies that appear to lie in the orbit are found not to be there at all but outside of it, sometimes laterally or behind the orbit. The recent method of Vogt (using soft rays) which reveals the greater part of the bulb free from surrounding bone has been found valuable in localizing very small foreign bodies.

Another field for roentgen diagnosis is in the inflammatory changes within the orbits, the object being to show whether the adjacent sinuses are involved. Of the inflammatory diseases of the bone, the most common one is tuberculosis which usually localizes at the os zygomatum. By means of roentgen examination the diagnosis can be established and the extent of the focus determined. Fractures also comprise a fruitful field for roentgen diagnosis. Delicate ribbon-like dense shadows observed in the frontal exposure of the sella and in the sagittal exposure of the superior orbital fissure are due to calcification of the carotid artery.